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CORM AND CORMEL BEHAVIOUR IN *GLADIOLUS* IN A SHORT-SEASON ENVIRONMENT

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INTRODUCTION

Experience has shown that corms of comparatively late varieties of *Gladiolus* become less suitable for planting in successive years more rapidly in a short-season than in a long-season environment. This study is an attempt to account for the foregoing condition, and, also, to set forth and explain certain other factors whereby the corm and cormel behaviour are significant in affecting the quality of the next year's stock. To arrive at a criterion by means of which the value of a corm may be judged for a short-season environment, attention has been given particularly to a consideration of width, depth, and volume of the corms.

The results reported here are based on a study over a two-year period, and have been derived by using material in the Gladiolus Test Garden at the University of Alberta. This test garden was started in the spring

of 1935, and was made possible through the generous co-operation of a number of growers and originators of new varieties in Canada and the United States. In 1935, 213 varieties, which totalled slightly more than 1,500 bloom-sized corms, were received for trial. In the spring of 1936, 85 new varieties were received and some inferior ones of the previous year were discarded so that 285 varieties were grown the second year, and the total number of bloom-sized corms increased to 2,025. In addition, special study has been made of the behaviour of several thousand cormels. The purposes and results of the test garden work, together with a treatise on gladiolus culture, including historical and botanical considerations, have been prepared in detail for a separate publication.

DESCRIPTION OF THE PLOTS

The gladiolus plots have been located in the horticultural area at the University of Alberta. In 1935, only one plot, about ¼ acre in area, on level ground, and fully exposed to the sun, was used. The soil was a black loam, in which garden crops had been grown for several years previously. Shelterbelts gave fairly good protection from wind. No manure was applied in either year. In 1935, commercial fertilizer was applied as a top-dressing just before bloom. In 1936, two plots were used,

the one of the previous season for bloom-sized corms and another for the growing of cormels. The former was uniformly fertilized with a topdressing of a complete mineral fertilizer; the latter was left untreated.

THE MEASUREMENTS

Most growers in the trade divide corms into large, medium and small, according to their width. Large wholesale firms use an older system to grade corms, but also on the basis of width, No. 1 being 1½ inches and over; Nos. 2 to 6 referring to sizes which decrease respectively by ¼ inch. Although such terms as "high crowned" and "plump" are used to refer to corms of good quality, no grades in the trade are based on depth or volume. A purpose of this study is to determine whether grades based on width, depth, and volume are a guide to the quality of any variety.

In 1935 and 1936, measurements of width and depth of each corm planted in the test garden were recorded at planting time and at harvest. The width and depth figures in the tables in the section on Corm Quality are the averages for the varieties, and the volumes were calculated from these. It is realized that this volume only approximates the cubic content. It assumes the corm to be cylindrical and does not consider the rounding off at the top and bottom. It was impossible, also, to measure

the exact depth in all cases, because of irregularities in shape. An average depth was recorded in all cases as accurately as possible. Because results are generally in accord with field observations and are borne out, for the most part, by the experience of local growers, it is believed that the method of handling the data has, in spite of many obstacles, served a useful purpose in evaluating responses. This accordance with cases which have become known by experience increases the confidence in respect to the validity of conclusions which are presented in the text.

NUMBER OF DAYS REQUIRED FROM PLANTING TO BLOOM

The Canadian Gladiolus Society has issued a report, the results of a symposium held in Ontario, where the growing season is long, and based mainly upon the behaviour of varieties there, in which the season of bloom is classified as follows: Early (less than 75 days); Early midseason (75-80 days); Midseason (80-85 days); Late midseason (85-90 days); and Late (over 90 days).

It is easily seen, Table I, that there is a great difference in the number of days required from planting to bloom for the same variety in Ontario and Alberta. A variety is considered in bloom when the first floret of any normal plant in that variety opens fully.

TABLE I

Days to bloom of varieties at the University of Alberta compared with the 1936 Canadian Gladiolus Society classification

Canadian Gladiolus Society ratings					University of Alberta		
Early (less than 75 days)	Early midseason (75-80 days)	Midseason (80-85 days)	Late midseason (85-90 days)	Late (over 90 days)	1935	1936	Av.
Gold Eagle					86	81	84
Cherokee					94	86	90
	Mibloom				76	83	80
	Aida				81	80	81
	Clarion				90	78	84
	Orange Queen				94	86	90
	Bon Echo				98	88	93
	Apricot Glow				97	92	95
	Janet				104	86	95
	Orange Sovereign				103	89	96
	Jonquil				102	91	97
	Goldfinch				99	96	98
	Pelegrina				108	94	101
		Mrs. Galbraith			86	91	89
		Ethelyn			92	91	92
		Crimson Glow			98	90	94
		Jessie			90	97	94
		Blue Danube			98	94	96
		Joyful			107	90	99
		King George			106	92	99
		Giant Nymph			100	100	100
		Joerg's White			112	88	100
		Ruffled Gold			109	91	100
		Coronation			110	93	102
		Yvonne			103	100	102
		Benedict			112	94	103
		Troubadour			114	94	104
		Gloriana			109	102	106

TABLE I (Continued)

Canadian Gladiolus Society ratings					University of Alberta		
Early (less than 75 days)	Early midseason (75-80 days)	Midseason (80-85 days)	Late midseason (85-90 days)	Late (over 90 days)	1935	1936	Av.
		Reverie			118	94	106
		Anna Eberius			122	95	109
		Picardy			116	101	109
		Duna			120	104	112
		Commander Koehl			116	113	115
		Director			121	111	116
		Albatross			118	122	120
		Aflame			127	120	124
			Duchess of Athol		93	88	91
			Maid of Orleans		84	100	92
			Berty Snow		94	94	94
			Krimhilde		105	91	98
			Dr. Moody		105	94	100
			Duchess of York		94	106	100
			Rideau		110	91	101
			Gertrude		99	107	103
			Marmora		106	104	105
			Reverie		118	94	106
			Primate		111	102	107
			Emile Aubrun		116	99	108
			Pfitzer's Triumph		113	102	108
			Mrs. Anna Pfitzer		111	109	110
			Pride of Wanakah		119	101	110
			Golden Dream		108	113	111
			Mammoth White		125	98	112
			Mrs. P.W. Sisson		108	116	112
			Orange Butterfly		128	97	113
			Sultan		124	105	115
			Heavenly Blue		119	112	116
			Our Selection		119	115	117
			Mrs. Leon Douglas		123	113	118
			Wurtembergia		129	113	121

TABLE I (Continued)

Canadian Gladiolus Society ratings					University of Alberta		
Early (less than 75 days)	Early midseason (75-80 days)	Midseason (80-85 days)	Late midseason (85-90 days)	Late (over 90 days)	1935	1936	Av.
				Betty Nuthall	Did	not	bloom
				Mrs.Hornberger	"	"	"
				Mr. W.H. Phipps	"	"	"

At the University of Alberta there were no varieties which, in the two-year period, averaged less than 75 days to bloom, the nearest approach being 81 days. In general, varieties in the Early and Early midseason classes require 5 to 20 days longer at Edmonton than in Ontario. Varieties in later classes require up to 39 days longer to bloom than in the east, and most ones classified as late will bloom at Edmonton only when started indoors.

The difference in blooming times of the same variety in long and short-season environments becomes greater in later blooming varieties. This points to a marked difference in the latter part of the growing season as compared to the first part in a short-season environment. The plant grows well during the early part of the season, after the soil has become sufficiently warm, but after a certain period, the growth rate slows up, so that maturity is attained much later than would be normally expected.

CLASSIFICATION OF BLOOMING SEASONS FOR A SHORT-SEASON ENVIRONMENT

It became obvious, from the time of bloom in the test garden, that re-classification was essential in order to study corm behaviour in different seasons of bloom in a short-season environment. In the classification for Edmonton conditions (Table II), the names and divisions are the same as those used by the Canadian

TABLE II

Classification of blooming seasons for a short-season environment

Early (85 days and under)	Early midseason (86-93 days)	Midseason (94-101 days)	Late midseason (102-109 days)	Late (110 days and over
Aida	Achillas	Apricot Glow	Anna Eberius	Aflame
Cinderella	Antione	Bit o'Heaven	Appleblossom	Albatross
Clarion	Bon Echo	Blue Danube	Beauty Wave	Berty Snow
Dr. Van Fleet	Break o'Day	Cara Mia	Belinde	Betty Nuthall
Gold Eagle	Butterboy	Coronation	Benedict	Bill Sowden
Linnet	Cardinal Prince	Copper Bronze	Betty Co-Ed	Bobby
Manhattan	Cherokee	Crimson Glow	Betty Joy	Carmen Sylva
Mibloom	Copper Face	Dr. Moody	Captain Boynton	Commander Koehl
Philomela	Dorothy Vernon	Duchess of York	Cherry Red	Director
Quinton	Duchess of Athol	E.J. Shaylor	Conflagration	Dracocephalus sp.
Souvenir	Ethelyn	Elizabeth Tabor	Emile Aubrun	Dr. F.E. Bennett
	Fuergarbe	Giant Nymph	Gertrude	Duna
	Gladdie Boy	Goldfinch	Gloriana	Flaming Meteor
	Golden Swallow	Helen Howard	Groff's Majestic	Golden Dream
	Heinrich Kansleiter	Indian Maiden	Hilda	Heavenly Blue
	Jewel	James Dunlop	Juan de Fuca	Isolene
	Kunderd's Yellow Wonder	Janet	Los Angeles	Lady Winsome
	Lacinatus	Jocelyn	Loyalty	Mammoth White
	Mauvette	Joe Coleman	Marietta	Memory of Wm.Pfitzer
	Medina	Joerg's White	Marmora	Mother Machree
	Miss Bloomington	Jonquil	Olive Goodrich	Mrs. F.C. Hornberger
	Miss Greeley	Joyful	Pfitzer's Triumph	Mrs. Leon Douglas
	Mrs. B.J. Steves	Krimhilde	Peep o'Day	Mrs. P.W. Sisson
	Mrs. Galbraith	Marie Kunderd	Picardy	Predominator
	Orange Queen	Morning Glory	Princess Yaada	Pride of Wanakah
	Prince of Wales	Nimbus	Queen of the Night	Streak of Butter
	Revue	Opalescent	Reverie	Sultan
	Rosewings	Orange King	Serrata	Vermilion
	Salmon Plume	Orange Lady	The Grand Guardian	
	Sunshine Susie	Orange Sovereign	Troubadour	
	Sweet Lavender	Pelegrina	Viola Steves	
	Thomas Edison	Prudence		
	White Butterfly	Rideau		
	Yellow Mask	Rose Doree		
		Schwaben Girl		
		Yvonne		

Gladiolus Society, but the Early class has been placed at 85 days and under, 10 days later than the eastern classification. The class interval for a short-season environment has been placed at 8 days, 3 days longer than the eastern classification. This has been thought to be reasonable in view of the longer time required for varieties to bloom here. Late varieties are those which require 110 days or more, 20 days longer than the corresponding class in the eastern classification.

It seems desirable to emphasize the fact that, on the average, there is a difference of only about 10 days in blooming time of early varieties in Ontario and the Prairie Provinces, but there is a difference of 20 days between the comparative blooming times of late varieties. Cool soil in the spring in the Prairie Provinces would, partially at least, account for the 10-day longer period to bloom of early varieties. The reason for the lagging of late varieties still further behind would seem to be due to: (a) a still greater decrease in the growth rate of late varieties after the time that the early ones begin to bloom, due to cool nights; (b) the cool soil in the spring makes for a slower rate of growth in late than in early varieties, this difference not being present under eastern conditions. Probably the most important factor in this regard is the cool nights in the latter part of the summer, which greatly retard maturation of late varieties. In Eastern Canada, at the corresponding time, the nights are warm, so that

there is little checking effect, the result being a much shorter time required for blooming of the same varieties.

CULTURAL PRACTICES THAT DIFFER IN LONG-SEASON AND SHORT-SEASON ENVIRONMENTS

Time of Planting

Planting can be done over a much longer period under long-season than under short-season conditions. Experience has shown that in the Edmonton district the best time to plant is the last week in April. If the corms are planted too early under short-season conditions, (a) the tender shoots may suffer from late spring frosts, or (b) cool soil may retard growth so that little benefit results. Planting should be completed by May 10 to have any hope of blooming the later varieties in a short-season environment. Although most people will not plant late varieties in this district, many worthwhile ones can be successfully grown by starting them indoors about a month prior to the usual planting time and transplanting them later.

Depth of Planting

In regions with a long growing season, the usual depth of planting is 5 to 6 inches, which has proved too deep for Alberta conditions. At the beginning of May, the soil at this depth here is too cool to permit rapid germination. Hence, the subsequent growth is slow, so that chances for bloom from corms planted deeply are slight. Depth of planting in the test garden has been 3 inches, which is recommended for most Alberta conditions. By planting at this depth, several advantages result: (a) the plant grows more quickly and produces flowers earlier; (b) the corms mature more rapidly; (c) more cormels are produced. The chief disadvantage of shallow planting is that anchorage of the plant is poor, and staking, although not entirely avoided by deep planting, is essential.

General Culture

Certain cultural practices which are well adapted to a long-season environment are not successful here. Amongst these may be mentioned the practice of mulching. Some outstanding growers in Ontario mulch their entire planting, finding that by doing so they secure earlier and better bloom, with a minimum of effort in

controlling weeds. Experiments here with straw and peat mulches applied at various times throughout the season, proved beyond question that the use of these mulches in a short-season environment is not to be recommended, for although moisture has been conserved well, the tendency has been for the soil to remain too cool to promote strong and rapid plant growth.

CORM BEHAVIOUR

Number of Cormels Produced per Corm

It is a recognized fact that the ability of a corm to produce few, a moderate number, or many cormels is inherent in the variety. Over a period of years the number per variety will vary, but varieties can be grouped according to the average number of cormels which are produced per corm (Table III). The corm will produce a larger number of cormels in some years than in others. In 1936, for instance, the number of cormels produced was much greater than in 1935 (Table IV). Owing to the hot, dry season, blooming times in this season were considerably shorter than in the latter. In the 1936 season, therefore, the corms had a longer time to mature. On this basis, it would seem logical to assume that early varieties would produce more cormels per corm than late

TABLE III

Varieties grouped according to number of cormels produced per parent corm

---

0-11: Aida, Albatross, Antione, Appleblossom, Belinde, Berty Snow, Bon Echo, Captain Boynton, Cardinal Prince, Carmen Sylva, Cherry Red, Copper Bronze, Dorothy Vernon, Dracocephalus sp., Dr. F.E. Bennett, Duchess of York, Elizabeth Tabor, Ethelyn, Flaming Meteor, Fuergarbe, Gertrude, Giant Nymph, Gladdie Boy, Gloriana, Gold Eagle, Golden Dream, Golden Swallow, Heinrich Kansleiter, Helen Howard, Isolene, Krimhilde, Lacinatus, Lady Winsome, Loyalty, Mammoth White, Marie Kunderd, Marietta, Mauvette, Miss Greeley, Orange Queen, Orange Sovereign, Peep o'Day, Pfitzer's Triumph, Predominator, Prudence, Reverie, Schwaben Girl, Sweet Lavender, Troubadour, Viola Steves, Yellow Mask, Yvonne.

11-20: Aflame, Alice Tiplady, Apricot Glow, Benedict, Blue Danube, Break o'Day, Cara Mia, Cinderella, Clarion, Commander Koehl, Dr. Moody, Dr. Van Fleet, E.J. Shaylor, Heavenly Blue, James Dunlop, Janet, Jewel, Jonquil, Kunderd's Yellow Wonder, Lilac Wonder, Linnet, Manhattan, Memory of Wm. Pfitzer, Mother Machree, Mrs. P.W. Sisson, Nimbus, Olive Goodrich, Orange Butterfly, Orange Lady, Pelegrina, Phenomenon, Philomela, Primate, Prince of Wales, Princess Yaada, Queen of the Night, Revue, Rose Doree, Rosewings, Salmon Plume, Streak of Butter, Sunshine Susie, The Grand Guardian, Vermilion.

21-30: Beauty Wave, Betty Joy, Bill Sowden, Bobby, Conflagration, Copper Face, Coronation, Duna, Groff's Majestic, Juan de Fuca, Mibloom, Morning Glory, Mrs. B.J. Steves, Mrs. F.C. Hornberger, Mrs. Galbraith, Opalescent, Serrata, Souvenir, Sultan, White Butterfly.

31-40: Achillas, Bit o'Heaven, Butterboy, Crimson Glow, Duchess of Athol, Thomas Edison.

41-50: Director, Goldfinch, Jocelyn, Miss Bloomington, Picardy, Quinton.

51-60: Joyful, Mrs. Leon Douglas, Orange King, Rideau.

61-70: Cherokee, Joe Coleman, Marmora, Medina.

71-80: Pride of Wanakah.

81-90: Betty Co-Ed, Betty Nuthall.

151-160: Emile Aubrun.

TABLE IV

Number of cormels produced per corm by early, early-midseason, midseason, late-midseason, and late varieties

	1935	1936		1935	1936
Early varieties (85 days and under)					
Aida	6	3	Manhattan	18	5
Cinderella	9	16	Mibloom	9	27
Clarion	13	9	Philomela	4	15
Dr. Van Fleet	11	6	Quinton	28	46
Gold Eagle	3	9	Souvenir	5	29
Linnet	12	9	Average	10.73	15.82
Early-midseason varieties (86-93 days)					
Achillas	33	11	Lacinatus	8	10
Antione	6	5	Mauvette	10	3
Bon Echo	4	4	Medina	14	64
Break o'Day	8	12	Miss Bloomington	45	45
Butterboy	32	38	Miss Greeley	7	4
Cardinal Prince	5	3	Mrs. B.J. Steves	6	21
Cherokee	70	24	Mrs. Galbraith	14	25
Copper Face	26	5	Orange Queen	5	1
Dorothy Vernon	4	1	Prince of Wales	0	14
Duchess of Athol	11	32	Revue	15	7
Ethelyn	1	2	Rosewings	11	1
Fuergarbe	6	2	Salmon Plume	16	3
Gladdie Boy	9	26	Sunshine Susie	10	17
Golden Swallow	3	3	Sweet Lavender	3	6
Heinrich Kansleiter	3	3	Thomas Edison	22	31
Jewel	14	10	Yellow Mask	0	0
Kunderd's Yellow Wonder	12	2	Average	13.12	13.18
Midseason varieties (94-101 days)					
Apricot Glow	11	9	Joe Coleman	66	47
Bit o'Heaven	38	15	Joerg's White	1	2
Blue Danube	18	3	Jonquil	4	13
Cara Mia	2	12	Joyful	56	24
Coronation	22	19	Krimhilde	0	2
Copper Bronze	7	7	Marie Kunderd	5	0
Crimson Glow	32	17	Morning Glory	10	29
Dr. Moody	11	12	Nimbus	17	11
Duchess of York	7	9	Opalescent	6	25
E.J. Shaylor	14	9	Orange King	55	32
Elizabeth Tabor	2	6	Orange Lady	20	7
Giant Nymph	3	1	Pelegrina	3	11
Goldfinch	42	28	Prudence	2	2

TABLE IV (Continued)

	1935	1936		1935	1936
Helen Howard	8	10	Rideau	54	28
Indian Maiden	6	3	Rose Doree	14	17
James Dunlop	8	16	Schwaben Girl	0	2
Janet	15	7	Yvonne	4	5
Jocelyn	50	28	Average	17.51	13.37
Late-midseason varieties (102-109 days)					
Anna Eberius	11	8	Los Angeles	7	5
Appleblossom	5	5	Loyalty	6	10
Beauty Wave	17	27	Marietta	8	5
Belinde	7	10	Marmora	22	68
Benedict	20	3	Olive Goodrich	1	16
Betty Co-Ed	36	84	Pfitzer's Triumph	4	2
Betty Joy	23	24	Peep o'Day	4	0
Captain Boynton	1	1	Picardy	35	45
Cherry Red	8	4	Princess Yaada	17	2
Conflagration	26	3	Queen of the Night	8	16
Emile Aubrun	65	158	Reverie	2	2
Gertrude	10	3	Serrata	15	26
Gloriana	9	1	The Grand Guardian	9	12
Groff's Majestic	10	24	Troubadour	1	2
Hilda	0	1	Viola Steves	0	1
Juan de Fuca	24	10	Average	13.26	18.65
Late varieties (110 days and over)					
Aflame	14	3	Heavenly Blue	14	2
Albatross	0	0	Isolene	10	4
Berty Snow	3	1	Lady Winsome	8	2
Betty Nuthall	9	90	Mammoth White	0	0
Bill Sowden	5	26	Memory of Wm.Pfitzer	13	12
Bobby	20	23	Mother Machree	13	1
Carmen Sylva	8	4	Mrs. F.C. Hornberger	14	23
Commander Koehl	5	16	Mrs. Leon Douglas	23	57
Director	16	50	Mrs. P.W. Sisson	4	13
Dracocephalus sp.	1	5	Predominator	7	2
Dr. F.E. Bennett	5	6	Pride of Wanakah	14	73
Duna	23	21	Streak of Butter	18	6
Flaming Meteor	7	9	Sultan	30	1
Golden Dream	1	0	Vermilion	13	6
			Average	10.64	16.29

Average number of cormels per corm of all varieties

1935	13.47
1936	15.20

varieties. This, however, did not prove to be the case. As a matter of fact, late varieties produced, on the average, just as many cormels as did early varieties. Certain varieties, however, irrespective of the season of bloom, never produce a liberal increase.

With respect to these tables, the corms considered were those which measured 1 inch and up. In many varieties such corms give rise, in addition to cormels, to an increase which is larger than the standard cormel size, and which goes into No. 6 corm size (¼-½ inch). To allow for this, therefore, this class was included with the cormels, and the cormel numbers indicated in Tables III and IV worked out on this basis.

The inheritance of cormel producing ability is purely fortuitous as far as season of bloom is concerned, which disproves a common belief that early varieties, having a longer time to mature than late varieties, will produce a greater number of cormels.

Cormel Germination

The quickest and best method of propagating varieties of Gladiolus is to grow them from cormels. The fact that some varieties produce cormels which will not germinate readily is recognized, and has been a source of concern to the grower who desires to propagate what is

otherwise a good commercial variety. It is rare for a variety to germinate 100 per cent. The rate of germination, also, varies considerably.

There are several methods which are commonly used to make the cormel germinate more quickly than it normally would. Scarification by various means, water soaking, and acid treatment are among these.

It was thought that an experiment which would indicate the most practical method of pre-planting treatment would be of considerable value. Thirteen varieties were selected from which 150 uniform cormels were taken, and divided into three lots of 50 each. One lot was scarified by breaking the cormel coat between the fingers, another was soaked in water for 24 hours, and a third lot served as a check. It would have been desirable to vary the time of soaking, but there was insufficient stock to permit this.

There are recognized weaknesses in this experiment which made it impossible to analyze the results statistically. There have been no replicates, on account of scarcity of stock. Results on nearby soil might have varied widely from those obtained, and it is therefore impossible to state that the latter is a true indication of reactions from the treatments. Also the class intervals in Table V are not equal. Although no conclusive statement can be made as to the results obtained in this experiment, the trends discussed seem quite definite.

TABLE V

Effect of scarification and soaking of cormels on germination. In each case 50 cormels were planted. Figures indicate number germinating.

	Days from planting															
	11	13	15	18	20	22	25	27	29	32	34	36	39	41	43	Total
Bit o' Heaven																
Scarified			17	22	2	3	1	1	1				1			48
Soaked		1	30	12		2		2				1	2			50
Check			14	24	2	1		1		4			3			49
Cherokee																
Scarified			11	11	1	5	1	1		1	1				1	33
Soaked			6	10	4	4			2	1				1		28
Check			5	14	2	3	3	3	1				1	3		35
Clarion																
Scarified			1	33	1	4	3			1		3	1		2	49
Soaked			12	24	1	7	1		1			1	1		1	49
Check		2	3	20	1	4	6		7	1			3			47
Crimson Glow																
Scarified				10	1	6	8		1		1	5	6		2	40
Soaked				14	11	4	5		3				4			41
Check					2	5	5		7			2	5			26
Director																
Scarified					1	1			2			3	8	1	11	27
Soaked				3		2	1	1	1				1			9
Check					1	2	2	2						2	1	10
Emile Aubrun																
Scarified			8	8	5	6	2	2	2			2	1			36
Soaked			5	10	1	9	3			2			1			31
Check			3	7	5	7	2	2	2	2					2	32

TABLE V (Continued)

	Days from planting															
	11	13	15	18	20	22	25	27	29	32	34	36	39	41	43	Total
Joyful																
Scarified				17	6	10	3	3	5	1			1		1	47
Soaked				10	3	4	5	1	9			5	4	1	4	46
Check				4	1	8	6	6	4	4		5	4		3	45
Kunderd's Yellow Wonder																
Scarified			3	16	3	7	12		1			2			2	46
Soaked	1		17	15	2	4	3	2	4	1						49
Check			5	4	6	7	7	2	1	2		6	5		1	46
Lady Primrose																
Scarified				4	8	6	13		8	1		6	1	2		49
Soaked				2	3		7	2	10	5		13	5		2	49
Check				2	1	1	3		4	9		14	7	3	3	47
Miss Bloomington																
Scarified		2	22	18	5		1	1								49
Soaked			19	20	4	2	1			1				1		48
Check		1	26	15	1	2		1				3				49
Mrs. Galbraith																
Scarified			6	10	4	4	6	2	1	3	1	2	3		4	46
Soaked			4	9	5		9	1		3	1	2	5		1	40
Check			4	6		6	3		5	4		1	5	3	2	39
Picardy																
Scarified		6	20	8		3	3			2						42
Soaked	10	10	17	4	1	1	2					1	2			48
Check	1	5	25	3		8	2						1		1	46
Rideau																
Scarified			4	13	4	2	2	3		4		1	2			35
Soaked			10	15	3	2			3	3		3	2		2	43
Check				15	6	7	1		1	5		2	1	1		39

The germination results varied greatly (Table V). The figures opposite the treatments represent the number of shoots showing above the ground. For instance, 15 days after planting, 17 cormels of the scarified lot of the variety "Bit o' Heaven" had germinated. In the following three days, 22 cormels germinated. All cormels were planted on the same day, and spaced about two inches apart.

That there is a correlation between the character of the cormel coat and the rapidity of germination is shown in this study. Hence, the varieties in the experiment can be classified on the basis of the results as to the best treatment for cormel germination. Certain varieties show the greatest benefit from soaking, others from scarification. In general, soaking increased the rate of germination of varieties which naturally germinate quickly. Varieties which respond best to scarification have tougher cormel coats, and naturally germinate more slowly.

Late blooming and relatively poor propagating varieties, such as Director, have very hard cormel coats which are not softened by 24-hour soaking. In such cases, breaking of the coat seems to make possible more rapid germination than does soaking.

There is a strong indication (Table VI), that pre-planting treatment of cormels of gladiolus varieties will appreciably affect the amount of corm material which

TABLE VI

Effect of scarifying and soaking of cormels before planting upon corm and cormel production. In each case 50 cormels were planted.

Variety	Treatment	Size of corms harvested						Cormels
		1½" up	1¼-1½"	1-1¼"	¾-1"	½-¾"	¼-½"	
Bit o'Heaven	Scarified		2	3	29	9	3	1,000
	Soaked		8	19	15	5	6	1,150
	Check		4	10	18	13	2	925
Cherokee	Scarified			9	11	9	3	775
	Soaked			2	5	9	18	480
	Check			1	8	9	15	500
Clarion	Scarified	1	3	7	11	17	7	480
	Soaked	1	7	15	11	3	7	550
	Check		1	7	8	11	18	330
Crimson Glow	Scarified				11	14	12	725
	Soaked				8	14	16	500
	Check				3	10	10	450
Director	Scarified					3	24	105
	Soaked					5	3	85
	Check					3	15	75
Emile Aubrun	Scarified		2	4	4	7	12	575
	Soaked				3	9	18	200
	Check			3	4	7	13	350
Joyful	Scarified			2	35	5	1	925
	Soaked				20	20	5	550
	Check			4	26	12	2	800
Kunderd's Yellow Wonder	Scarified		2	7	2	25	5	825
	Soaked	1	5	7	18	12	5	700
	Check		1	7	12	11	13	600
Lady Primrose	Scarified				7	34	8	725
	Soaked				2	22	22	600
	Check				2	21	25	675
Miss Bloomington	Scarified		4	8	5	15	16	600
	Soaked		4	5	5	16	20	625
	Check		3	7	6	14	18	800
Mrs. Galbraith	Scarified			12	2	15	6	400
	Soaked			6	10	11	7	425
	Check			3	8	10	12	300

TABLE VI (Continued)

Variety	Treatment	Size of corms harvested						Cormels
		1½" up	1¼-1½"	1-1¼"	¾-1"	½-¾"	¼-½"	
Picardy	Scarified		6	6	15	7	15	350
	Soaked		4	8	20	6	6	425
	Check		2	5	18	14	7	360
Rideau	Scarified			1	1	10	22	360
	Soaked				2	3	25	200
	Check				2	2	28	200

TABLE VII

Summary of scarification and soaking before planting upon cormel production

	Excess over (+), or decrease (-) from check	
	Scarified No.	Soaked No.
Scarification best:		
Cherokee	+275	- 20
Crimson Glow	275	+ 50
Director	30	+ 10
Emile Aubrun	225	-150
Joyful	125	-250
Kunderd's Yellow Wonder	225	+100
Lady Primrose	50	- 75
Rideau	160	0
Soaking best:		
Bit o'Heaven	+ 75	+225
Clarion	150	220
Mrs. Galbraith	100	125
Picardy	10	65
Both treatments harmful:		
Miss Bloomington	-200	-175

will be harvested. Where there was most rapid and complete germination, the harvest was most satisfactory. Of the six varieties where best germination resulted from soaking, there was a decided excess in corm and cormel production of the soaked lots over the scarified and check lots. For example, the soaked lot of the variety Kunderd's Yellow Wonder increased in cormel number to a lesser extent than the scarified lot, but the corm production was of higher quality. Although soaking seemed the best treatment in the varieties Crimson Glow and Rideau from the germination standpoint, the harvest was greater from the scarified lots. With two exceptions, lots of those varieties which germinated most successfully after scarification also produced the best increase. One of these, the variety Mrs. Galbraith, produced approximately the same as the soaked lot.

Examination of all varieties in the experiment after harvest gave the following results: the varieties Cherokee, Crimson Glow, Director, Emile Aubrun, Lady Primrose, Miss Bloomington, and Mrs. Galbraith all possessed fairly thick cormel coats. The remainder of the varieties were found to possess thin cormel coats and the general response was most favorable to soaking, although here, too, there were two discrepancies, Kunderd's Yellow Wonder and Rideau.

Deleterious effects from treatment, as in the case of Miss Bloomington, are difficult to explain. Characteristics of propagation may in some cases differ

[illegible]

[illegible]

[illegible]

from what the cormel coat indicates. In several cases, increase from soaked lots was less than the checks. Soaking encourages fungus growth which may have become well established, and caused much damage subsequent to germination, so that growth and production were poor.

There seems to be a correlation between ability to germinate readily and propagation. Varieties in which the soaked lot germinated most readily after soaking produced more cormels and more large corms than the scarified or check lots. The same was true of those varieties where scarification proved the best aid in promoting germination.

The best index of the ability of a cormel to germinate readily is likely the appearance of the seed coat. If the cormel is small, and the coat thick and very hard, scarification is recommended as the best practice. If the cormel is large and thin-skinned, germination and corm production would likely be increased by soaking. Varietal characteristics undoubtedly play a large part in germination and subsequent growth, and it is therefore impossible to apply any rule-of-thumb method other than that previously given.

In the opinion of the author, the results indicate that from pre-planting treatment of cormels: (a) the time required for germination is decreased; (b) the number of cormels harvested at the end of the season is increased; (c) the time necessary to bring the treated

cormels to blooming-size is materially decreased; (d) in general, the type of treatment to use can be predicted from the nature of the cormel coat.

Corm Quality

A corm of Gladiolus when grown under average short-season conditions may, at harvest, be smaller or larger than when planted. If smaller, it is likely that next fall it will be still more so, since there is less food reserve built up to supply the shoot in the early stages of growth. The volume of the corm harvested therefore indicates its quality, which refers to its ability to produce a satisfactory flower and to maintain its corm size. This section of the study deals with methods of estimating probable future quality.

Whether width of corm at planting is any index of the quality of the corm produced at the end of the season had not been definitely proved when this study was undertaken. General opinion, however, is that the width of a corm is not so important a factor as depth as an index of subsequent growth and corm development. In spite of this, commercial grades are based on width. Catalogues invariably grade corms according to width, rather than depth or volume. Most growers are strongly of the belief that corms which are plump and high-crowned will produce high-quality corms, but their viewpoint is based on

experience rather than on experimental evidence. It was decided, therefore, to investigate the matter and to attempt to arrive at a definite conclusion. This study does not take into account the so-called "Jumbo" corms, which are exceptionally wide and usually of high volume but often quite shallow. Such corms are usually quite old, and do not produce flowers of as high quality as do younger corms.

In an endeavor to determine corm quality and its significance in a short-season environment, the width and depth of each corm at the beginning and end of the seasons were recorded. Only varieties which were grown both years were used. Varieties were grouped according to season of bloom, so that comparisons could be made between corms in these classes. Division into the various seasonal classes has been made, and the average width, depth, and volume calculated (Table VIII). Only corms which measured 1½ inches and over enter into this part of the study.

Width, depth and volume as indices of corm quality.

This study of corm quality has been dealt with using corm measurements of width and depth. Corm quality to the commercial grower is based on width, and he charges according to it. It seemed, therefore, that a study which would estimate the value of this method of judging corms might be of some practical value. All varieties available

TABLE VIII

Average width, depth and volume of varieties of different seasons of bloom

Variety	1935								1936							
	Spring				Fall				Spring				Fall			
	No.	Width	Depth	Volume	No.	Width	Depth	Volume	No.	Width	Depth	Volume	No.	Width	Depth	Volume
		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.
Early (85 days and under)																
Aida	7	1.82	.643	1.69	9	2.15	.708	2.57	8	2.20	.719	2.71	7	1.96	.768	2.32
Cinderella	1	1.50	.500	0.88	1	1.50	.500	0.88	1	1.50	.500	0.88	5	1.50	.675	1.20
Clarion	20	1.82	.807	2.11	34	2.00	.861	2.72	34	2.00	.861	2.72	53	1.96	.684	2.06
Dr. Van Fleet	6	1.69	.708	1.58	11	1.85	.772	2.07	10	1.89	.813	2.27	13	2.18	.721	2.67
Gold Eagle	44	1.84	.673	1.79	56	1.76	.683	1.66	12	2.08	.771	2.62	18	1.93	.549	1.60
Linnet	5	1.65	.800	1.70	7	1.96	1.000	3.02	7	1.96	1.000	3.02	10	1.75	.700	1.56
Manhattan	5	1.73	.750	1.67	7	2.39	.857	3.84	7	2.39	.857	3.84	11	1.90	.659	1.87
Mibloom	5	1.75	.500	1.21	6	1.67	.625	1.37	6	1.67	.625	1.37	8	1.83	.625	1.64
Philomela	6	1.95	.771	2.31	6	1.85	.708	1.89	10	1.84	.738	1.96	11	1.70	.670	1.46
Quinton	5	1.73	.700	1.64	4	1.59	.750	1.50	4	1.59	.750	1.50	2	1.50	.593	1.05
Souvenir	12	1.87	.521	1.43	14	1.75	.705	1.56	10	1.84	.863	2.30	12	1.78	.729	1.82
Average	10.54	1.76	.670	1.64	14.09	1.86	.743	2.10	9.91	1.91	.772	2.29	13.64	1.82	.670	1.75
Early-midseason (86-93 days)																
Achillas	10	1.95	.725	2.17	10	2.55	.863	3.96	10	2.55	.863	3.96	16	1.97	.703	2.13
Antione	3	1.67	.625	1.37	5	1.68	.725	1.60	5	1.68	.725	1.60	5	1.73	.700	1.64
Bon Echo	10	1.73	.575	1.34	10	1.80	.750	1.91	10	1.80	.750	2.03	11	1.72	.636	1.48
Break o'Day	12	1.80	.656	1.67	21	1.80	.798	2.03	10	1.99	.900	2.84	15	2.01	.768	2.43
Butterboy	10	2.15	.813	2.95	11	2.66	.989	5.50	10	2.75	1.000	5.76	27	1.91	.731	2.08
Cardinal Prince	15	1.57	.675	1.30	17	1.86	.831	2.26	10	2.01	.900	2.87	14	2.03	.830	2.70
Cherokee	10	1.94	.888	2.62	10	2.38	.888	3.95	10	2.38	.888	3.95	11	2.03	.784	2.54
Copper Face	5	1.85	.700	1.87	4	1.59	.781	1.58	4	1.59	.781	1.58	3	1.75	.708	1.71

TABLE VIII (Continued)

Variety	1935								1936							
	Spring				Fall				Spring				Fall			
	No.	Width	Depth	Volume	No.	Width	Depth	Volume	No.	Width	Depth	Volume	No.	Width	Depth	Volume
		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.
Dorothy Vernon	5	1.73	.700	1.64	1	1.50	.500	0.88	1	1.50	.500	0.88	6	1.54	.754	1.41
Duchess of Athol	3	1.58	.583	1.14	5	1.75	.675	1.63	4	1.81	.688	1.76	4	1.94	.656	1.94
Ethelyn	5	1.68	.600	1.34	6	1.58	.646	1.27	6	1.58	.646	1.27	7	1.52	.589	1.07
Fuergarbe	5	1.75	.650	1.57	6	1.71	.646	1.48	5	1.75	.650	1.48	7	1.51	.500	0.90
Gladdie Boy	5	1.85	.650	1.74	4	1.88	.781	2.17	4	1.88	.781	2.17	7	1.79	.643	1.62
Golden Swallow	2	1.50	.688	1.22	5	1.70	.850	1.93	5	1.70	.850	1.93	2	2.00	.688	2.16
Heinrich Kansleiter	5	1.90	.800	2.27	9	1.85	.694	1.86	9	1.85	.694	1.86	15	1.86	.717	1.90
Jewel	15	1.90	.791	2.24	17	1.65	.728	1.55	10	1.76	.735	1.79	15	1.68	.750	1.66
Kunderd's Yellow Wonder	14	1.77	.625	1.52	23	2.04	.821	2.67	10	2.38	.900	4.00	15	1.81	.667	1.70
Lacinatus	1	1.50	.500	0.88	1	1.50	.750	1.32	1	1.50	.750	1.32	10	1.53	.613	1.12
Mauvette	5	1.78	.700	1.75	5	1.95	.850	2.54	1	2.25	1.000	3.96	1	1.50	.750	1.33
Medina	4	1.59	.717	1.43	5	1.83	.750	1.97	5	1.83	.750	1.97	7	1.77	.625	1.53
Miss Bloomington	10	1.80	.825	2.10	16	1.88	.719	2.09	10	2.00	.775	2.44	17	1.77	.662	1.62
Miss Greeley	1	1.65	.625	1.21	4	1.97	.781	2.36	29	1.91	.858	2.47	30	2.24	.829	3.26
Mrs. B.J. Steves	6	1.71	.688	1.58	6	1.98	.771	2.37	6	1.98	.771	2.37	14	2.09	.821	2.80
Mrs. Galbraith	14	1.59	.770	1.53	14	1.64	.643	1.36	9	1.72	.653	1.51	9	1.76	.639	1.55
Orange Queen	9	1.64	.597	1.26	9	1.59	.611	1.21	8	1.61	.609	1.24	5	1.60	.650	1.31
Prince of Wales	5	1.63	.575	1.20	4	1.75	.625	1.51	4	1.75	.625	1.51	6	1.88	.646	1.80
Revue	5	1.70	.650	1.47	7	1.71	.696	1.59	7	1.71	.696	1.59	9	1.65	.583	1.24
Rosewings	5	1.73	.625	1.47	5	2.18	.775	2.89	5	2.18	.775	2.89	6	1.69	.646	1.45
Salmon Plume	5	2.00	.750	2.36	10	1.74	.688	1.63	10	1.74	.688	1.63	13	1.78	.817	2.04
Sunshine Susie	6	1.69	.854	1.91	9	1.90	.708	2.01	9	1.90	.708	2.01	12	2.06	.708	1.98
Sweet Lavender	4	1.50	.656	1.16	3	1.79	.833	2.10	3	1.79	.833	2.10	5	1.80	.800	2.04
Thomas Edison	10	1.61	.638	1.30	9	1.68	.611	1.36	9	1.68	.611	1.36	8	1.80	.797	2.03
White Butterfly	1	1.63	.500	1.04	2	1.56	.625	1.34	2	1.56	.625	1.34	15	1.60	.750	1.51
Yellow Mask	3	1.54	.542	1.01	1	1.50	.625	1.11	1	1.50	.625	1.11	1	1.75	.750	1.80
Average	6.71	1.72	.675	1.61	8.06	1.83	.736	2.04	7.09	1.86	.753	2.19	10.24	1.80	.703	1.81

TABLE VIII (Continued)

Variety	1935								1936							
	Spring				Fall				Spring				Fall			
	No.	Width	Depth	Vol-ume	No.	Width	Depth	Vol-ume	No.	Width	Depth	Vol-ume	No.	Width	Depth	Vol-ume
		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.
Midseason (94-101 days)																
Apricot Glow	13	1.73	.644	1.51	25	1.74	.760	1.80	10	1.90	.875	2.48	19	1.82	.704	1.83
Berty Snow	9	1.65	.583	1.24	9	1.69	.722	1.61	8	1.87	.734	2.01	6	1.77	.520	1.15
Bit o' Heaven	19	1.63	.947	1.97	20	2.21	1.000	3.82	20	2.21	1.000	3.82	36	2.14	.868	3.12
Blue Danube	3	1.58	.583	1.14	3	1.88	.833	2.33	3	1.88	.833	2.33	4	1.88	.719	2.00
Cara Mia	2	1.50	.563	0.99	1	1.50	.500	0.88	1	1.50	.500	0.88	1	1.75	.500	1.20
Coronation	10	1.78	1.030	2.56	15	1.87	1.040	2.88	15	1.87	1.040	2.88	21	2.11	.720	2.51
Copper Bronze	12	1.66	.802	1.73	19	1.77	.901	2.19	10	1.92	.975	2.82	18	1.56	.681	1.31
Crimson Glow	27	1.69	.792	1.78	35	1.71	.800	1.84	10	1.92	.875	1.78	14	1.61	.643	1.31
Dr. Moody	5	1.55	.510	0.96	3	1.71	.625	1.44	3	1.71	.625	1.44	5	1.68	.675	1.40
Duchess of York	9	1.56	.653	1.24	4	1.54	.719	1.34	4	1.54	.719	1.34	18	1.63	.792	1.65
E.J. Shaylor	5	1.75	.675	1.62	4	1.63	.625	1.30	4	1.63	.625	1.30	6	1.71	.563	1.29
Elizabeth Tabor	10	1.79	.688	1.74	6	1.54	.563	1.05	6	1.54	.563	1.05	7	1.61	.643	1.30
Giant Nymph	33	1.59	.701	1.39	18	1.59	.688	1.36	10	1.66	.738	1.60	6	2.10	.729	2.52
Goldfinch	11	2.02	.866	2.85	11	1.82	.864	2.25	10	1.85	.875	2.35	21	1.86	.750	2.04
Helen Howard	15	1.86	.725	1.97	21	1.74	.714	1.70	10	1.90	.763	2.17	12	1.98	.719	2.22
Indian Maiden	5	1.50	.625	1.11	2	1.63	.688	1.43	2	1.63	.681	1.43	1	1.88	.750	2.08
James Dunlop	5	1.60	.650	1.32	5	1.75	.750	1.80	5	1.75	.750	1.80	6	2.14	.833	3.00
Janet	16	1.69	.570	1.27	21	1.88	.667	1.86	9	1.92	.684	1.99	21	1.80	.560	1.43
Jocelyn	6	1.71	.667	1.52	7	1.66	.661	1.43	7	1.66	.661	1.43	5	1.90	.650	1.84
Joe Coleman	1	1.50	.625	1.11	4	1.59	.750	1.49	4	1.59	.750	1.49	2	1.81	.687	1.76
Joerg's White	5	1.73	.650	1.54	6	1.83	.750	1.97	6	1.83	.750	1.97	6	2.25	.833	3.31
Jonquil	10	2.01	1.000	3.18	11	2.16	.909	3.35	11	2.16	.909	3.35	14	1.70	.776	1.77
Joyful	12	1.59	.604	1.22	14	1.55	.652	1.23	14	1.55	.652	1.23	20	1.59	.663	1.32
Krimhilde	5	1.65	.625	1.34	1	1.50	.750	1.33	1	1.50	.750	1.33	3	1.71	.750	1.72
Marie Kunderd	5	1.53	.575	1.05	5	1.60	.700	1.41	1	1.75	.875	2.10	1	1.63	.625	1.30
Morning Glory	12	2.03	.927	3.00	16	1.74	.703	1.67	9	1.87	.764	2.10	16	1.78	.711	1.78
Nimbus	5	1.73	.700	1.65	4	1.66	.719	1.56	4	1.66	.719	1.56	5	1.60	.600	1.21

TABLE VIII (Continued)

Variety	1935								1936							
	Spring				Fall				Spring				Fall			
	No.	Width	Depth	Volume	No.	Width	Depth	Volume	No.	Width	Depth	Volume	No.	Width	Depth	Volume
		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.
Opalescent	14	1.84	.777	2.07	14	1.66	.689	1.49	10	1.73	.715	1.68	5	1.90	.675	1.91
Orange King	25	1.80	.740	1.89	26	1.75	.784	1.89	26	1.75	.784	1.89	34	2.08	.732	2.49
Orange Lady	6	1.75	.708	1.70	5	1.78	.725	1.80	2	2.00	.813	2.56	2	1.50	.688	1.22
Orange Sovereign	12	1.69	.739	1.65	13	2.07	.827	2.78	13	2.07	.827	2.78	15	2.14	.733	2.64
Pelegrina	4	1.63	.688	1.43	1	1.50	.625	1.11	1	1.50	.625	1.11	9	1.64	.625	1.32
Prudence	4	1.53	.531	0.98	1	1.50	.625	1.11	1	1.50	.625	1.11	6	1.50	.583	1.05
Rideau	10	1.88	.775	2.15	12	1.79	.688	1.73	12	1.79	.688	1.73	18	1.74	.639	1.52
Rose Doree	5	1.80	.750	1.91	7	1.66	.732	1.59	7	1.66	.732	1.59	14	1.71	.652	1.47
Schwaben Girl	3	1.75	.791	1.78	3	1.63	.667	1.39	9	1.68	.611	1.36	8	1.97	.766	2.33
Yvonne	10	1.63	.738	1.54	8	1.70	.656	1.50	6	1.77	.667	1.64	3	1.75	.792	1.90
Average	9.81	1.70	.709	1.65	10.27	1.72	.732	1.75	7.95	1.76	.751	1.88	11.03	1.81	.691	1.82
Late-midseason (102-109 days)																
Anna Eberius	5	1.58	.700	1.37	6	1.77	.750	1.84	6	1.77	.750	1.84	5	1.65	.550	1.17
Appleblossom	5	2.40	.725	3.26	10	1.80	.688	1.75	10	1.80	.688	1.75	7	1.71	.643	1.48
Beauty Wave	10	1.76	.645	1.57	12	1.83	.719	1.89	10	1.90	.735	2.09	10	2.00	.575	1.81
Belinde	5	1.60	.575	1.16	1	1.50	.750	1.33	1	1.50	.750	1.33	2	1.50	.625	1.11
Benedict	3	1.50	.708	1.25	5	1.85	.750	2.02	5	1.85	.750	2.02	3	2.08	.650	2.21
Betty Co-Ed	5	1.60	.700	1.45	8	1.84	.734	1.96	8	1.84	.734	1.96	14	1.82	.732	1.90
Betty Joy	3	1.63	.581	1.22	3	1.63	.790	1.66	3	1.63	.790	1.66	6	1.60	.689	1.38
Captain Boynton	4	1.66	.656	1.42	4	1.72	.875	2.03	4	1.72	.875	2.03	2	1.63	.625	1.29
Cherry Red	5	1.73	.650	1.55	8	1.70	.844	1.92	5	1.83	.900	2.36	5	1.80	.675	1.73
Conflagration	5	1.72	.625	1.46	5	1.78	.778	1.94	3	1.92	.792	2.29	2	1.69	.688	1.55

TABLE VIII (Continued)

Variety	1935								1936							
	Spring				Fall				Spring				Fall			
	No.	Width	Depth	Volume	No.	Width	Depth	Volume	No.	Width	Depth	Volume	No.	Width	Depth	Volume
		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.
Emile Aubrum	5	1.78	.725	1.80	4	2.25	.875	3.48	4	2.25	.875	3.48	4	2.38	.875	3.89
Gertrude	5	1.85	.800	2.15	6	1.79	.771	1.96	6	1.79	.771	1.96	7	1.80	.661	1.70
Gloriana	10	1.78	.750	1.86	21	1.69	.720	1.62	10	1.75	.763	1.83	9	1.69	.638	1.43
Groff's Majestic	10	2.01	.950	3.02	17	1.85	.897	2.41	10	1.99	.950	2.96	14	1.70	.679	1.54
Hilda	5	1.58	.775	1.52	5	1.55	.750	1.41	5	1.55	.750	1.41	13	1.69	.817	1.84
Juan de Fuca	5	1.78	.725	1.80	5	1.93	.825	2.41	5	1.93	.825	2.41	7	1.77	.875	2.16
Los Angeles	5	1.78	.700	1.74	7	1.55	.625	1.17	4	1.69	.656	1.47	3	1.50	.625	1.01
Loyalty	9	1.89	.639	1.69	8	2.02	.688	2.20	6	2.19	.750	2.80	8	2.09	.781	2.68
Marietta	13	1.67	.673	1.34	12	2.07	.872	2.93	10	2.13	.880	3.16	5	1.85	.700	1.88
Marmora	27	1.66	.736	1.59	29	1.84	.767	2.04	10	1.86	.775	2.11	10	1.81	.675	1.74
Olive Goodrich	7	1.61	.804	1.64	4	1.59	.719	1.43	4	1.59	.719	1.43	8	1.58	.672	1.32
Pfitzer's Triumph	27	1.66	.755	1.64	14	1.61	.634	1.29	7	1.75	.679	1.64	4	1.53	.563	1.04
Peep o'Day	11	1.85	.682	1.79	14	1.96	.697	2.10	9	2.11	.736	2.59	13	2.06	.769	2.57
Picardy	8	1.70	.797	1.81	8	1.88	.766	2.13	8	1.88	.766	2.13	13	1.97	.740	2.26
Princess Yaada	4	1.72	.719	1.68	6	1.79	.813	2.04	6	1.79	.813	2.04	8	1.75	.719	1.73
Queen of the Night	3	1.54	.708	1.32	3	1.54	.708	1.32	3	1.54	.708	1.32	3	1.67	.583	1.27
Reverie	10	2.30	.888	3.67	17	1.63	.787	1.64	17	1.63	.787	1.64	16	1.77	.711	1.75
Serrata	4	1.63	.563	1.17	2	1.63	.688	1.43	2	1.63	.688	1.43	1	1.75	.750	1.80
The Grand Guardian	3	1.74	.588	1.39	3	1.54	.542	1.32	3	1.54	.542	1.32	9	1.72	.625	1.45
Troubadour	5	1.90	.625	1.79	4	1.84	.811	2.16	3	1.96	.875	2.60	3	1.92	.792	2.29
Viola Steves	4	1.63	.625	1.30	2	2.00	.750	2.36	2	2.00	.750	2.36	5	1.85	.875	2.35
Average	7.42	1.75	.703	1.72	8.16	1.77	.754	1.91	6.10	1.82	.768	2.01	7.06	1.78	.696	1.78

TABLE VIII (Continued)

Variety	1935								1936							
	Spring				Fall				Spring				Fall			
	No.	Width	Depth	Vol-ume	No.	Width	Depth	Vol-ume	No.	Width	Depth	Vol-ume	No.	Width	Depth	Vol-ume
		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.
								Late (110 days and over)								
Aflame	5	1.55	.575	1.07	4	1.97	.840	2.56	4	1.97	.840	2.56	4	1.88	.719	1.99
Albatross	5	1.93	.775	2.27	4	1.81	.700	1.80	2	1.94	.750	2.22	2	1.63	.630	1.32
Berty Snow	9	1.65	.583	1.25	9	1.69	.722	1.62	8	1.87	.734	2.01	6	1.77	.520	1.15
Betty Nuthall	8	1.58	.656	1.29	5	1.88	.850	2.36	5	1.88	.850	2.36	8	1.65	.657	1.40
Bill Sowden	3	1.50	.792	1.40	7	1.55	.786	1.47	5	1.58	.800	1.57	4	1.63	.625	1.29
Bobby	10	1.70	.763	1.73	10	2.28	.913	3.72	10	2.28	.913	3.72	18	1.94	.632	1.86
Carmen Sylva	8	1.52	.766	1.38	12	1.55	.750	1.41	10	1.55	.750	1.41	2	1.56	.500	0.94
Commander Koehl	4	1.50	.656	1.16	3	1.58	.750	1.47	3	1.58	.750	1.47	1	1.75	.875	2.10
Director	7	1.57	.679	1.32	11	1.61	.660	1.34	11	1.61	.660	1.34	11	1.55	.648	1.22
Dracocephalus Sp.	12	1.67	.635	1.39	12	1.62	.729	1.50	10	1.51	.750	1.34	15	1.69	.550	1.23
Dr. F.E. Bennett	17	1.57	.691	1.33	14	1.56	.634	1.21	9	1.58	.640	1.25	2	1.50	.625	1.11
Duna	4	1.59	.750	1.49	4	1.94	.938	2.78	4	1.94	.938	2.78	4	1.83	.792	2.08
Flaming Meteor	12	1.83	1.010	2.66	14	1.78	.803	2.07	14	1.78	.803	2.07	16	1.58	.664	1.30
Golden Dream	24	1.86	.766	2.08	30	1.63	.779	1.62	10	1.68	.875	1.94	9	1.69	.722	1.62
Heavenly Blue	5	1.50	.750	1.32	5	1.55	.675	1.27	4	1.56	.688	1.31	1	1.63	.625	1.29
Isolene	1	1.50	.625	1.11	2	1.56	.625	1.18	2	1.56	.625	1.18	2	1.50	.625	1.11
Lady Winsome	5	1.73	.700	1.64	5	1.68	.675	1.50	4	1.72	.687	1.60	3	1.54	.667	1.24
Mammoth White	5	1.60	.925	1.86	9	1.64	.750	1.58	9	1.64	.750	1.58	18	1.72	.750	1.74
Memory of Wm. Pfitzer	1	1.50	.625	1.11	3	1.67	.750	1.64	3	1.67	.750	1.64	3	1.50	.500	0.88
Mother Machree	5	1.70	.750	1.70	5	1.85	.825	2.22	5	1.85	.825	2.22	6	1.63	.688	1.43
Mrs.F.C.Hornberger	4	1.75	.750	1.80	6	1.65	.813	1.73	5	1.68	.825	1.83	4	1.60	.594	1.20
Mrs. Leon Douglas	19	1.80	.730	1.86	13	1.71	.760	1.74	8	1.88	.828	2.29	9	1.63	.639	1.33
Mrs. P.W. Sisson	10	1.93	.735	2.15	7	1.57	.714	1.38	7	1.57	.714	1.38	15	1.69	.725	1.62
Predominator	11	1.80	.686	1.75	10	1.58	.675	1.32	8	1.59	.813	1.61	9	1.58	.667	1.30
Pride of Wanakah	11	1.58	.909	1.78	12	1.76	.771	1.89	8	1.86	.813	2.19	8	1.75	.781	1.89

TABLE VIII (Continued)

Variety	1935								1936							
	Spring				Fall				Spring				Fall			
	No.	Width	Depth	Vol-ume	No.	Width	Depth	Vol-ume	No.	Width	Depth	Vol-ume	No.	Width	Depth	Vol-ume
		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.		in.	in.	cu. in.
Streak of Butter	19	1.80	.743	1.89	23	1.86	.924	2.51	23	1.86	.924	2.51	20	1.86	.956	2.59
Sultan	5	1.55	.575	1.07	5	1.80	.675	1.72	5	1.80	.675	1.72	2	1.81	.750	1.93
Vermilion	10	1.78	.725	1.80	13	1.71	.644	1.48	5	1.88	.700	2.01	6	1.63	.625	1.30
Average	7.97	1.55	.678	1.60	8.57	1.60	.704	1.79	6.70	1.62	.722	1.90	6.93	1.56	.625	1.48

for the study were divided into the five seasonal classes, so that the average corm behaviour within each class could be observed.

The index of corm quality selected was cubic inches, as previously explained. Varieties whose corm width at planting averaged 1.75 inches and under were segregated into one class, and those over 1.75 inches into another. The volume of varieties in these classes at harvest time was then considered. It was thought that if the average volume of varieties whose corms averaged 1.75 inches in width in the spring was significantly in excess of that of varieties in which the corm was less than 1.75 inches in width, corm width would be shown to be a significant factor in an estimation of quality.

The division between deep and shallow corms was placed at 0.75 inches, and a segregation made into the two classes made on this basis, Table XI. The points of division between wide and narrow, and deep and shallow corms were purely arbitrary, and were selected because they resulted in a fairly even distribution of varieties.

This procedure was repeated using corm volume as an index of quality, Table XIII. Corms of high volume were considered to be over 1.80 cubic inches and those of low volume 1.80 cubic inches and under. This figure was obtained by computing the volume of a corm which was 1.75 inches in width and .75 inches in depth. The varieties were then segregated on this basis. The summaries following Tables IX, XI and XIII show the value of width, depth and volume, respectively, as means of evaluating corm quality.

TABLE IX

Width of corm as an index of quality of the next season's corm. (Figures are the average number of cubic inches harvested of varieties whose corm widths in the spring averaged 1.75 inches and under, and over 1.75 inches, respectively).

1935				1936			
1.75 and under		Over 1.75		1.75 and under		Over 1.75	
Early (85 days and under)							
Cinderella	0.88	Aida	2.57	Cinderella	1.20	Aida	2.32
Dr. Van Fleet	2.07	Clarion	2.72	Mibloom	1.64	Clarion	2.06
Linnet	3.02	Gold Eagle	1.66	Quinton	1.05	Dr. Van Fleet	2.67
Manhattan	3.84	Philomela	1.89			Gold Eagle	1.60
Mibloom	1.37	Souvenir	1.56			Linnet	1.56
Quinton	1.50					Manhattan	1.87
						Philomela	1.46
						Souvenir	1.82
Av. no. cubic in. harvested	2.49		2.08		1.30		1.92
Early-midseason (86-93 days)							
Antione	1.60	Achillas	3.96	Antione	1.64	Achillas	2.13
Bon Echo	1.91	Break o'Day	2.03	Copper Face	1.71	Bon Echo	1.48
Cardinal Prince	2.26	Butterboy	2.03	Dorothy Vernon	1.41	Break o'Day	2.43
Dorothy Vernon	0.88	Cherokee	3.95	Ethelyn	1.07	Butterboy	2.08
Duchess of Athol	1.63	Copper Face	1.58	Fuergarbe	0.90	Cardinal Prince	2.70
Ethelyn	1.27	Gladdie Boy	2.17	Golden Swallow	2.16	Cherokee	2.54
Fuergarbe	1.48	Heinrich Kansleiter	1.86	Lacinatus	1.12	Duchess of Athol	1.94
Golden Swallow	1.93	Jewel	1.55	Mrs. Galbraith	1.55	Gladdie Boy	1.62
Lacinatus	1.32	Kunderd's Yellow Wonder	2.67	Orange Queen	1.31	Heinrich Kansleiter	1.90
Medina	1.97	Mauvette	2.54	Prince of Wales	1.80	Jewel	1.66
Miss Greeley	2.36			Revue	1.24	Kunderd's Yellow Wonder	1.70
Mrs. B.J. Steves	2.37			Salmon Plume	2.04		

TABLE IX (Continued)

1935				1936			
1.75 and under		Over 1.75		1.75 and under		Over 1.75	
Mrs. Galbraith	1.36	Miss Bloomington	2.00	Thomas Edison	2.03	Mauvette	1.33
Orange Queen	1.21	Salmon Plume	1.63	White Butterfly	1.51	Medina	1.53
Prince of Wales	1.51			Yellow Mask	1.80	Miss Bloomington	1.62
Revue	1.59					Miss Greeley	3.26
Rosewings	2.89					Mrs. B.J. Steves	2.80
Sunshine Susie	2.01					Rosewings	1.45
Sweet Lavender	2.10					Sunshine Susie	1.98
Thomas Edison	1.36					Sweet Lavender	2.04
White Butterfly	1.34						
Yellow Mask	1.11						
Av. no. cubic in. harvested	1.70		2.62		1.55		2.01
Midseason (94-101 days)							
Apricot Glow	1.80	Coronation	2.88	Cara Mia	1.20	Apricot Glow	1.83
Berty Snow	1.61	Elizabeth Tabor	1.05	Dr. Moody	1.40	Berty Snow	1.15
Bit o'Heaven	3.82	Goldfinch	2.25	Duchess of York	1.65	Bit o'Heaven	3.12
Blue Danube	2.33	Helen Howard	1.70	E.J. Shaylor	1.29	Blue Danube	2.00
Cara Mia	0.88	Jonquil	3.35	Elizabeth Tabor	1.30	Coronation	2.51
Copper Bronze	2.19	Morning Glory	1.67	Giant Nymph	2.52	Copper Bronze	1.31
Crimson Glow	1.84	Opalescent	1.49	Indian Maiden	2.08	Crimson Glow	1.31
Dr. Moody	1.44	Orange King	1.89	James Dunlop	3.00	Goldfinch	2.04
Duchess of York	1.34	Rideau	1.73	Jocelyn	1.84	Helen Howard	2.22
E.J. Shaylor	1.30	Rose Doree	1.59	Joe Coleman	1.76	Janet	1.43
Giant Nymph	1.36			Joyful	1.32	Joerg's White	3.31
Indian Maiden	1.43			Krimhilde	1.72	Jonquil	1.77
James Dunlop	1.80			Marie Kunderd	1.30	Morning Glory	1.78
Janet	1.86			Nimbus	1.21	Orange Lady	1.22
Jocelyn	1.43			Opalescent	1.91	Orange Sovereign	2.64
Joe Coleman	1.49			Orange King	2.49	Rideau	1.52
Joerg's White	1.97			Pelegrina	1.32	Yvonne	1.90

TABLE IX (Continued)

1935				1936			
1.75 and under		Over 1.75		1.75 and under		Over 1.75	
Joyful	1.23			Prudence	1.03		
Krimhilde	1.33			Rose Doree	1.47		
Marie Kunderd	1.41			Schwaben Girl	2.33		
Nimbus	1.56						
Orange Lady	1.80						
Orange Sovereign	2.78						
Pelegrina	1.11						
Prudence	1.11						
Schwaben Girl	1.39						
Yvonne	1.50						
Av. no. cubic in. harvested	1.67		1.96		1.71		1.94
Late - midseason (102-109 days)							
Anna Eberius	1.84	Appleblossom	1.75	Belinde	1.11	Anna Eberius	1.17
Belinde	1.33	Beauty Wave	1.89	Betty Joy	1.38	Appleblossom	1.48
Benedict	2.02	Emile Aubrun	3.48	Captain Boynton	1.29	Beauty Wave	1.81
Betty Co-Ed	1.96	Gertrude	1.96	Gloriana	1.43	Benedict	2.21
Betty Joy	1.66	Gloriana	1.62	Hilda	1.84	Betty Co-Ed	1.90
Captain Boynton	2.03	Groff's Majestic	2.41	Los Angeles	1.01	Cherry Red	1.73
Cherry Red	1.92	Juan de Fuca	2.41	Olive Goodrich	1.32	Conflagration	1.55
Conflagration	1.94	Los Angeles	1.17	Pfitzer's Triumph	1.04	Emile Aubrun	3.89
Hilda	1.41	Loyalty	2.20	Queen of the Night	1.27	Gertrude	1.70
Marietta	2.93	Peep o'Day	2.10	Reverie	1.75	Groff's Majestic	1.54
Marmora	2.04	Reverie	1.64	Serrata	1.80	Juan de Fuca	2.16
Olive Goodrich	1.43	Troubadour	2.16	The Grand Guardian	1.45	Loyalty	2.68
Pfitzer's Triumph	1.29					Marietta	1.88
Picardy	2.13					Marmora	1.74
Princess Yaada	2.04					Peep o'Day	2.57
Queen of the Night	1.32					Picardy	2.26
						Princess Yaada	1.73

TABLE IX (Continued)

1935				1936			
1.75 and under		Over 1.75		1.75 and under		Over 1.75	
Serrata	1.43					Troubadour	2.29
The Grand Guardian	1.32					Viola Steves	2.35
Viola Steves	2.36						
Av. no. cubic in. harvested	1.81		2.07		1.39		2.03
Late (110 days and over)							
Aflame	2.56	Albatross	1.80	Bill Sowden	1.29	Aflame	1.99
Berty Snow	1.62	Flaming Meteor	2.07	Carmen Sylva	0.94	Albatross	1.32
Betty Nuthall	2.36	Golden Dream	1.62	Commander Koehl	2.10	Berty Snow	1.15
Bill Sowden	1.47	Mrs. Leon Douglas	1.74	Director	1.22	Betty Nuthall	1.40
Bobby	3.72	Mrs. P.W. Sisson	1.38	Dracocephalus sp.	1.23	Bobby	1.88
Carmen Sylva	1.41	Predominator	1.34	Dr. F.E. Bennett	1.11	Duna	2.08
Commander Koehl	1.47	Streak of Butter	2.51	Golden Dream	1.62	Flaming Meteor	1.30
Director	1.34	Vermilion	1.48	Heavenly Blue	1.29	Mother Machree	1.43
Dracocephalus sp.	1.50			Isolene	1.11	Mrs. Leon Douglas	1.33
Dr. F.E. Bennett	1.21			Lady Winsome	1.24	Pride of Wanakah	1.89
Duna	2.78			Mammoth White	1.74	Streak of Butter	2.59
Heavenly Blue	1.27			Memory of Wm. Pfitzer	0.88	Sultan	1.93
Isolene	1.18			Mrs.F.C.Hornberger	1.20	Vermilion	1.30
Lady Winsome	1.50			Mrs. P.W. Sisson	1.62		
Mammoth White	1.58			Predominator	1.30		
Memory of Wm. Pfitzer	1.64						
Mother Machree	2.22						
Mrs. F.C. Hornberger	1.73						
Pride of Wanakah	1.89						
Sultan	1.72						
Av. no. cubic in. harvested	1.81		1.74		1.33		1.66

TABLE X

Summary of Table IX

Season of bloom	Average number cubic inches harvested		Average excess in cubic inches of corms 1.75 in. and over, above those under 1.75 in.
	1.75 in. and under	Over 1.75 in.	
Early	1.90	2.00	0.10
Early-midseason	1.63	2.32	0.69
Midseason	1.69	1.95	0.26
Late-midseason	1.60	2.05	0.45
Late	1.57	1.70	0.13
Average			0.326

TABLE XI

Depth of corm as an index of quality of the next season's corm. (Figures are the average number of cubic inches harvested of varieties whose corm depths in the spring averaged 0.75 inches and under, and over 0.75 inches, respectively).

1935				1936			
0.75 in. and under		Over 0.75 in.		0.75 in. and under		Over 0.75 in.	
Early (85 days and under)							
Aida	2.57	Clarion	2.72	Cinderella	1.20	Aida	2.32
Cinderella	0.88	Linnet	3.02	Philomela	1.46	Clarion	2.06
Dr. Van Fleet	2.07	Philomela	1.89	Quinton	1.05	Dr. Van Fleet	2.67
Gold Eagle	1.66					Gold Eagle	1.60
Manhattan	3.84					Linnet	1.56
Mibloom	1.37					Manhattan	1.87
Quinton	1.50					Mibloom	1.64
Souvenir	1.56					Souvenir	1.82
Av. no. cubic in. harvested	1.93		2.54		1.24		1.94
Early-midseason (85-93 days)							
Achillas	3.96	Butterboy	5.50	Antione	1.64	Achillas	2.13
Antione	1.60	Cherokee	3.95	Bon Echo	1.48	Break o'Day	2.43
Bon Echo	1.91	Heinrich Kansleiter	1.86	Dorothy Vernon	1.41	Butterboy	2.08
Break o'Day	2.03	Jewel	1.55	Duchess of Athol	1.94	Cardinal Prince	2.70
Cardinal Prince	2.26	Miss Bloomington	2.00	Ethelyn	1.07	Cherokee	2.54
Copper Face	1.58	Mrs. Galbraith	1.36	Fuergarbe	0.90	Copper Face	1.71
Dorothy Vernon	0.88	Sunshine Susie	2.01	Heinrich Kansleiter	1.90	Gladdie Boy	1.62
Duchess of Athol	1.63			Lacinatus	1.12	Golden Swallow	2.16
Ethelyn	1.27			Medina	1.53	Jewel	1.66
Fuergarbe	1.48			Mrs. Galbraith	1.55	Kunderd's Yellow Wonder	1.70
Gladdie Boy	2.17			Orange Queen	1.31	Mauvette	1.33
Golden Swallow	1.93			Prince of Wales	1.80	Miss Bloomington	1.62
Kunderd's Yellow Wonder	2.67			Revue	1.24	Miss Greeley	3.26
				Salmon Plume	2.04		

TABLE XI (Continued)

1935				1936			
0.75 in. and under		Over 0.75 in.		0.75 in. and under		Over 0.75 in.	
Lacinatus	1.32			Sunshine Susie	1.98	Mrs. B.J. Steves	2.80
Mauvette	2.54			Thomas Edison	2.03	Rosewings	1.45
Medina	1.97			White Butterfly	1.51	Sweet Lavender	2.04
Miss Greeley	2.36			Yellow Mask	1.80		
Mrs. B.J. Steves	2.37						
Orange Queen	1.21						
Prince of Wales	1.51						
Revue	1.59						
Rosewings	2.89						
Salmon Plume	1.63						
Sweet Lavender	2.10						
Thomas Edison	1.36						
White Butterfly	1.34						
Yellow Mask	1.11						
Av. no. cubic in. harvested	1.88		2.60		1.57		2.08
Midseason (94-101 days)							
Apricot Glow	1.80	Bit o'Heaven	3.82	Berty Snow	1.15	Apricot Glow	1.83
Berty Snow	1.61	Coronation	2.88	Cara Mia	1.20	Bit o'Heaven	3.12
Blue Danube	2.33	Copper Bronze	2.19	Dr. Moody	1.40	Blue Danube	2.00
Cara Mia	0.88	Crimson Glow	1.84	Duchess of York	1.65	Coronation	2.51
Dr. Moody	1.44	Goldfinch	2.25	E.J. Shaylor	1.29	Copper Bronze	1.31
Duchess of York	1.34	Jonquil	3.35	Elizabeth Tabor	1.30	Crimson Glow	1.31
E.J. Shaylor	1.30	Morning Glory	1.67	Giant Nymph	2.52	Goldfinch	2.04
Elizabeth Tabor	1.05	Opalescent	1.49	Indian Maiden	2.08	Helen Howard	2.22
Giant Nymph	1.36	Rideau	1.73	James Dunlop	3.00	Jonquil	1.77
Helen Howard	1.70	Schwaben Girl	1.39	Janet	1.43	Marie Kunderd	1.30
Indian Maiden	1.43			Jocelyn	1.84	Morning Glory	1.78
James Dunlop	1.80			Joe Coleman	1.76	Orange King	2.49

TABLE XI (Continued)

1935				1936			
0.75 in. and under		Over 0.75 in.		0.75 in. and under		Over 0.75 in.	
Janet	1.86			Joerg's White	3.31	Orange Lady	1.22
Jocelyn	1.43			Joyful	1.32	Orange Sovereign	2.64
Joe Coleman	1.49			Krimhilde	1.72		
Joerg's White	1.91			Nimbus	1.21		
Joyful	1.23			Opalescent	1.91		
Krimhilde	1.33			Pelegrina	1.32		
Marie Kunderd	1.41			Prudence	1.03		
Nimbus	1.56			Rideau	1.52		
Orange King	1.89			Rose Doree	1.47		
Orange Sovereign	2.78			Schwaben Girl	2.33		
Pelegrina	1.11			Yvonne	1.90		
Prudence	1.11						
Rose Doree	1.50						
Yvonne	1.50						
Av. no. cubic in. harvested	1.54		2.26		1.72		1.97
Late-midseason (102-109 days)							
Anna Eberius	1.84	Gertrude	1.96	Anna Eberius	1.17	Betty Joy	1.38
Appleblossom	1.75	Gloriana	1.62	Appleblossom	1.48	Captain Boynton	1.29
Beauty Wave	1.89	Groff's Majestic	2.41	Beauty Wave	1.81	Cherry Red	1.73
Belinde	1.33	Hilda	1.41	Belinde	1.11	Conflagration	1.55
Benedict	2.02	Olive Goodrich	1.43	Benedict	2.21	Emile Aubrun	3.89
Betty Co-Ed	1.96	Pfitzer's Triumph	1.29	Betty Co-Ed	1.90	Gertrude	1.70
Betty Joy	1.66	Picardy	2.13	Los Angeles	1.01	Gloriana	1.43
Captain Boynton	2.03	Reverie	1.64	Loyalty	2.68	Groff's Majestic	1.54
Cherry Red	1.92			Olive Goodrich	1.32	Hilda	1.84
Conflagration	1.94			Pfitzer's Triumph	1.04	Juan de Fuca	2.16
Emile Aubrun	3.48			Peep o'Day	2.57	Marietta	1.88
Juan de Fuca	2.41			Queen of the Night	1.27	Marmora	1.74
Los Angeles	1.17			Serrata	1.80	Picardy	2.26

TABLE XI (Continued)

1935				1936			
0.75 in. and under		Over 0.75 in.		0.75 in. and under		Over 0.75 in.	
Loyalty	2.20			The Grand Guardian	1.45	Princess Yaada	1.73
Marietta	2.93			Viola Steves	2.35	Reverie	1.75
Marmora	2.04					Troubadour	2.29
Peep o'Day	2.10						
Princess Yaada	2.04						
Queen of the Night	1.32						
Serrata	1.43						
The Grand Guardian	1.32						
Troubadour	2.16						
Viola Steves	2.36						
Av. no. cubic in. harvested	1.97		1.74		1.68		1.89
Late (110 days and over)							
Aflame	2.56	Albatross	1.80	Albatross	1.32	Aflame	1.99
Berty Snow	1.62	Bill Sowden	1.47	Berty Snow	1.15	Betty Nuthall	1.40
Betty Nuthall	2.36	Bobby	3.72	Carmen Sylva	0.94	Bill Sowden	1.29
Commander Koehl	1.47	Carmen Sylva	1.41	Commander Koehl	2.10	Bobby	1.86
Director	1.34	Flaming Meteor	2.07	Director	1.22	Duna	2.08
Dr. F.E. Bennett	1.21	Golden Dream	1.62	Dr. F.E. Bennett	1.11	Flaming Meteor	1.30
Duna	2.78	Mammoth White	1.58	Dracocephalus sp.	1.23	Golden Dream	1.62
Heavenly Blue	1.27	Streak of Butter	2.51	Heavenly Blue	1.29	Mother Machree	1.43
Isolene	1.18			Lady Winsome	1.24	Mrs.F.C.Hornberger	1.20
Lady Winsome	1.50			Isolene	1.11	Mrs. Leon Douglas	1.33
Memory of Wm. Pfitzer	1.64			Mammoth White	1.74	Predominator	1.30
Mother Machree	2.22			Memory of Wm. Pfitzer	0.89	Pride of Wanakah	1.89
Mrs.F.C.Hornberger	1.73			Mrs. P.W. Sisson	1.62	Streak of Butter	2.59
Mrs. Leon Douglas	1.74			Sultan	1.93		
Mrs. P.W. Sisson	1.38			Vermilion	1.30		

TABLE XI (Continued)

	1935		1936	
	0.75 in. and under	Over 0.75 in.	0.75 in. and under	Over 0.75 in.
Predominator	1.32			
Sultan	1.72			
Vermilion	1.48			
Dracocephalus sp.	1.50			
Pride of Wanakah	1.89			
Av. no. cubic in. harvested	1.70	2.02	1.35	1.64

TABLE XII

Summary of Table XI

Season of bloom	Average number cubic inches harvested		Average excess in cubic inches of corms over 0.75 inches and over, above those under 0.75 in.
	0.75 in. and under	Over 0.75 in.	
Early	1.59	2.24	0.65
Early-midseason	1.73	2.34	0.61
Midseason	1.63	2.12	0.49
Late-midseason	1.83	1.82	-0.01
Late	1.53	1.83	0.30
Average			0.408

TABLE XIII

Volume of corm as an index of quality of the next season's corm. (Figures are the average number of cubic inches harvested of varieties whose corm volumes in the spring averaged 1.80 cubic inches and under, and over 1.80 cubic inches, respectively).

1935				1936			
1.80 cu. in. and under		Over 1.80 cu. in.		1.80 cu. in. and under		Over 1.80 cu. in.	
Early (85 days and under)							
Aida	2.57	Clarion	2.72	Cinderella	1.20	Aida	2.32
Cinderella	0.88	Philomela	1.89	Mibloom	1.64	Clarion	2.06
Dr. Van Fleet	2.07			Quinton	1.05	Dr. Van Fleet	2.67
Gold Eagle	1.66					Gold Eagle	1.60
Linnet	3.02					Linnet	1.56
Manhattan	3.84					Manhattan	1.87
Mibloom	1.37					Philomela	1.46
Quinton	1.50					Souvenir	1.82
Souvenir	1.56						
Av. no. cubic in. harvested	2.05		2.31		1.30		1.92
Early-midseason (86-93 days)							
Antione	1.60	Achillas	3.96	Antione	1.64	Achillas	2.13
Bon Echo	1.91	Butterboy	5.50	Copper Face	1.71	Bon Echo	1.48
Break o'Day	2.03	Cherokee	3.95	Dorothy Vernon	1.41	Break o'Day	2.43
Cardinal Prince	2.26	Copper Face	1.58	Duchess of Athol	1.94	Butterboy	2.08
Dorothy Vernon	0.88	Heinrich Kansleiter	1.86	Ethelyn	1.07	Cardinal Prince	2.70
Duchess of Athol	1.63	Jewel	1.55	Fuergarbe	0.90	Cherokee	2.54
Ethelyn	1.27	Miss Bloomington	2.00	Jewel	1.66	Gladdie Boy	1.62
Fuergarbe	1.48	Salmon Plume	1.63	Lacinatus	1.12	Golden Swallow	2.16
Gladdie Boy	2.17	Sunshine Susie	2.01	Mrs. Galbraith	1.55	Heinrich Kansleiter	1.90
Golden Swallow	1.93			Orange Queen	1.31	Kunderd's Yellow Wonder	1.70
Kunderd's Yellow Wonder	2.67			Prince of Wales	1.80		
				Revue	1.24		

TABLE XIII (Continued)

1935				1936			
1.80 cu. in. and under		Over 1.80 cu. in.		1.80 cu. in. and under		Over 1.80 cu. in.	
Lacinatus	1.32			Salmon Plume	2.04	Mauvette	1.33
Mauvette	2.54			Thomas Edison	2.03	Medina	1.53
Medina	1.97			White Butterfly	1.51	Miss Bloomington	1.62
Miss Greeley	2.36			Yellow Mask	1.80	Miss Greeley	3.26
Mrs. B.J. Steves	2.37					Mrs. B.J. Steves	2.80
Mrs. Galbraith	1.36					Rosewings	1.45
Orange Queen	1.21					Sunshine Susie	1.98
Prince of Wales	1.51					Sweet Lavender	2.04
Revue	1.59						
Rosewings	2.89						
Sweet Lavender	2.10						
Thomas Edison	1.36						
White Butterfly	1.34						
Yellow Mask	1.11						
Av. no. cubic in. harvested	1.79		2.67		1.55		2.04
Midseason (94-101 days)							
Apricot Glow	1.80	Bit o'Heaven	3.82	Cara Mia	1.20	Apricot Glow	1.83
Berty Snow	1.61	Coronation	2.88	Crimson Glow	1.31	Berty Snow	1.15
Blue Danube	2.33	Goldfinch	2.25	Dr. Moody	1.40	Bit o'Heaven	3.12
Cara Mia	0.88	Helen Howard	1.70	Duchess of York	1.65	Blue Danube	2.00
Copper Bronze	2.19	Jonquil	3.35	E.J. Shaylor	1.29	Coronation	2.51
Crimson Glow	1.84	Morning Glory	1.67	Elizabeth Tabor	1.30	Copper Bronze	1.31
Dr. Moody	1.44	Opalescent	1.49	Giant Nymph	2.52	Goldfinch	2.04
Duchess of York	1.34	Orange King	1.89	Indian Maiden	2.08	Helen Howard	2.22
E.J. Shaylor	1.30	Rideau	1.73	James Dunlop	3.00	Janet	1.43
Elizabeth Tabor	1.05			Jocelyn	1.84	Joerg's White	3.31
Giant Nymph	1.36			Joe Coleman	1.76	Jonquil	1.77
Indian Maiden	1.43			Joyful	1.32	Marie Kunderd	1.30
James Dunlop	1.80			Krimhilde	1.72	Morning Glory	1.78

TABLE XIII (Continued)

1935				1936			
1.80 cu. in. and under		Over 1.80 cu. in.		1.80 cu. in. and under		Over 1.80 cu. in.	
Janet	1.86			Nimbus	1.21	Orange King	2.49
Jocelyn	1.43			Opalescent	1.91	Orange Lady	1.22
Joe Coleman	1.49			Pelegrina	1.32	Orange Sovereign	2.64
Joerg's White	1.97			Prudence	1.05		
Joyful	1.23			Rideau	1.52		
Krimhilde	1.33			Rose Doree	1.47		
Marie Kunderd	1.41			Schwaben Girl	2.33		
Nimbus	1.56			Yvonne	1.90		
Orange Lady	1.80						
Orange Sovereign	2.78						
Pelegrina	1.11						
Prudence	1.11						
Rose Doree	1.59						
Schwaben Girl	1.39						
Yvonne	1.50						
Av. no. cubic in. harvested	1.57		2.24		1.67		2.01
Late-midseason (102-109 days)							
Anna Eberius	1.84	Appleblossom	1.75	Appleblossom	1.48	Anna Eberius	1.17
Beauty Wave	1.89	Gertrude	1.96	Belinde	1.11	Beauty Wave	1.81
Belinde	1.33	Gloriana	1.62	Betty Joy	1.38	Benedict	2.21
Benedict	2.02	Groff's Majestic	2.41	Hilda	1.84	Betty Co-Ed	1.90
Betty Co-Ed	1.96	Picardy	2.13	Los Angeles	1.01	Captain Boynton	1.29
Betty Joy	1.66	Reverie	1.64	Olive Goodrich	1.32	Cherry Red	1.73
Captain Boynton	2.03			Pfitzer's Triumph	1.04	Conflagration	1.55
Cherry Red	1.92			Queen of the Night	1.27	Emile Aubrun	3.89
Conflagration	1.94			Reverie	1.75	Gertrude	1.70
Emile Aubrun	3.48			Serrata	1.80	Gloriana	1.43
Hilda	1.41			The Grand Guardian	1.45	Groff's Majestic	1.54
Juan de Fuca	2.41					Juan de Fuca	2.16
Los Angeles	1.17					Loyalty	2.68

TABLE XIII (Continued)

1935				1936			
1.80 cu. in. and under		Over 1.80 cu. in.		1.80 cu. in. and under		Over 1.80 cu. in.	
Loyalty	2.20					Marietta	1.88
Marietta	2.93					Marmora	1.74
Marmora	2.04					Peep o'Day	2.57
Olive Goodrich	1.43					Picardy	2.26
Pfitzer's Triumph	1.29					Princess Yaada	1.73
Peep o'Day	2.10					Troubadour	2.29
Princess Yaada	2.04					Viola Steves	2.35
Queen of the Night	1.32						
Serrata	1.43						
The Grand Guardian	1.32						
Troubadour	2.16						
Viola Steves	2.36						
Av. no. cubic in. harvested	1.91		1.92		1.40		1.99
Late (110 days and over)							
Aflame	2.56	Albatross	1.80	Bill Sowden	1.29	Aflame	1.99
Berty Snow	1.62	Flaming Meteor	2.07	Carmen Sylva	0.94	Albatross	1.32
Betty Nuthall	2.36	Golden Dream	1.62	Commander Koehl	2.10	Berty Snow	1.15
Bill Sowden	1.47	Mammoth White	1.58	Director	1.22	Betty Nuthall	1.40
Bobby	3.72	Mrs. P.W. Sisson	1.38	Dr. F.E. Bennett	1.11	Bobby	1.86
Carmen Sylva	1.41	Streak of Butter	2.51	Heavenly Blue	1.29	Duna	2.08
Commander Koehl	1.47			Isolene	1.11	Flaming Meteor	1.30
Director	1.34			Lady Winsome	1.24	Golden Dream	1.62
Dr. F.E. Bennett	1.21			Mammoth White	1.74	Mother Machree	1.43
Dracocephalus sp.	1.50			Memory of Wm. Pfitzer	0.89	Mrs.F.C.Hornberger	1.20
Duna	2.78			Mrs. P.W. Sisson	1.62	Mrs. Leon Douglas	1.33
Heavenly Blue	1.27			Predominator	1.30	Pride of Wanakah	1.89
Isolene	1.18			Sultan	1.93	Streak of Butter	2.59
Lady Winsome	1.50			Dracocephalus sp.	1.23	Vermilion	3.20
Memory of Wm. Pfitzer	1.64						

TABLE XIII (Continued)

	1935		1936	
	1.80 cu. in. and under	Over 1.80 cu. in.	1.80 cu. in. and under	Over 1.80 cu. in.
Mother Machree	2.20			
Mrs.F.C.Hornberger	1.73			
Mrs. Leon Douglas	1.74			
Predominator	1.32			
Pride of Wanakah	1.89			
Sultan	1.72			
Vermilion	1.48			
Av. no. cubic in. harvested	1.78	1.81	1.36	1.74

TABLE XIV

Summary of Table XIII

Season of bloom	Average number cubic inches harvested		Average excess in cubic inches of corms 1.80 cu. in. and over, above those under 1.80 cu. in.
	1.80 cu. in. and under	Over 1.80 cu. in.	
Early	1.68	2.12	0.44
Early-midseason	1.67	2.36	0.69
Midseason	1.62	2.13	0.51
Late-midseason	1.66	1.96	0.30
Late	1.57	1.78	0.21
Average			0.43

From a study of the results obtained (Table XV), the indication is that corm volume is better than depth, which in turn is better than width. To obtain more accurate results, a study of corm behaviour of a very large number of varieties, or a larger number of corms of a given variety, would be necessary. The figures represented are the average of two widely differing seasons, but are believed to conform fairly closely to a normal season.

There are at least two other methods by which a study of this kind might be made: (a) by corm weight; (b) by a study of individuals within a variety. The former would likely be of value in estimating corm quality. A start was made with this method but had to be discontinued due to lack of time and assistance. The latter method would estimate the best corm type within a variety, but would not lead to results which could be applied generally, because any variety may have characteristics which would vary the corm type from the average. This method would be of value if a very large number of varieties including all seasons of bloom was studied. It was impossible to use this method, however, due to lack of stock.

In all cases but one the volume harvested was greater from corms which in the spring had the greater measurement. If more varieties had been included, there would undoubtedly have been no exceptions in this regard.

TABLE XV

Width, depth and volume of corms as indices of quality of next season's corm

	Width			Depth			Volume		
	1.75 in. and under	Over 1.75 in.	Difference cu.in./corm	0.75 in. and under	Over 0.75 in.	Difference cu.in./corm	1.80 cu.in. and under	Over 1.80 cu.in.	Difference cu.in./corm
Early	1.90	2.00	0.10	1.59	2.24	0.65	1.68	2.12	0.44
Early-midseason	1.63	2.32	0.69	1.73	2.34	0.61	1.67	2.36	0.69
Midseason	1.69	1.95	0.26	1.63	2.12	0.49	1.62	2.13	0.51
Late-midseason	1.60	2.05	0.45	1.83	1.82	-0.01	1.66	1.96	0.30
Late	1.57	1.70	0.13	1.53	1.83	0.30	1.57	1.78	0.21
Average			0.326			0.408			0.43

The average of all seasonal classes shows the average excess in cubic inches harvested of wide over narrow, deep over shallow, and high over low volume corms. This excess in the case of depth and volume is nearly the same. It would be expected that the volume excess would be greater, since it takes both width and depth into account, but the slight increase which it shows is undoubtedly within experimental error and therefore cannot be said to be significant. The excess of these two over the width excess, however, seems to be significant.

This result points to the fact that it is possible that the trade method of grading corms might be placed on a more accurate basis were depth or volume considered.

The results are subject to error from the standpoint of climatic factors, and actual figures are not of very great significance. It would require many seasons of trial to arrive at normal season figures. Although the two years were not normal, it is believed that their average does approach it fairly closely. At any rate, all varieties, apart from minor differences, were subject to the same conditions, and it is believed that comparative results indicate the relative value of the different methods of corm evaluation in a normal season.

Corm Behaviour in Relation to Season of Bloom

It has often been remarked by local growers that in the Edmonton district late varieties will not succeed. Although such varieties will bloom successfully the year of importation, yet they flower so late that the corms will not fully mature, and chances of success in the following year are slight.

An attempt is made here to discover whether there was a significant difference in the status of early and late varieties after two years' growth in the test garden. To do this, all varieties which were grown both years were considered and grouped according to season of bloom. Those varieties which at harvest time, 1936, showed a gain from the fall of the first year were segregated into one group, and those which decreased, into another, and the total gain and total loss computed.

The reaction of varieties in the various seasonal classes to a short-season environment is significant (Table XVI). The figures, which are in cubic inches, indicate the volumes of corms of varieties before they were planted at Edmonton in the spring of 1935 and after harvest in 1936. It is assumed that the corms were mature, but in two years' growth would not have become depleted in vitality because of old age. Although decrease in size does not necessarily mean failure, those varieties which fail decreased decidedly.

TABLE XVI

Gain or loss in corm volume after two years' growth

	Spring 1935	Fall 1936	Gain or loss
	cu.in.	cu.in.	cu.in.
Early varieties (85 days and under)			
Varieties which gained:			
Aida	1.69	2.32	0.63
Cinderella	0.88	1.20	0.32
Dr. Van Fleet	1.58	2.67	1.09
Mibloom	1.21	1.64	0.43
Souvenir	1.43	1.82	0.39
Total gain			2.86
Varieties which lost:			
Clarion	2.11	2.06	0.05
Gold Eagle	1.79	1.60	0.19
Linnet	1.70	1.56	0.14
Philomela	2.31	1.46	0.85
Quinton	1.64	1.05	0.59
Total loss			1.82
Net gain			1.04
Early-midseason varieties (86-93 days)			
Varieties which gained:			
Antione	1.37	1.64	0.27
Bon Echo	1.34	1.48	0.14
Break o'Day	1.67	2.43	0.76
Cardinal Prince	1.30	2.70	1.40
Duchess of Athol	1.14	1.94	0.80
Golden Swallow	1.22	2.16	0.94
Kunderd's Yellow Wonder	1.52	1.70	0.18
Lacinatus	0.88	1.12	0.24
Medina	1.43	1.53	0.10
Miss Greeley	1.21	3.26	2.05
Mrs. B.J. Steves	1.58	2.80	1.22
Mrs. Galbraith	1.53	1.55	0.02
Orange Queen	1.26	1.31	0.05
Prince of Wales	1.20	1.80	0.60
Sunshine Susie	1.91	1.98	0.07
Sweet Lavender	1.16	2.04	0.88
Thomas Edison	1.30	2.03	0.73
White Butterfly	1.04	1.51	0.47
Yellow Mask	1.01	1.80	0.79
Total gain			11.71

TABLE XVI (Continued)

	Spring 1935	Fall 1936	Gain or loss
	cu.in.	cu.in.	cu.in.
Varieties which lost:			
Achillas	2.17	2.13	0.04
Butterboy	2.95	2.08	0.87
Cherokee	2.62	2.54	0.08
Copper Face	1.87	1.71	0.16
Dorothy Vernon	1.64	1.41	0.23
Ethelyn	1.34	1.07	0.27
Fuergarbe	1.57	0.90	0.67
Gladdie Boy	1.74	1.62	0.12
Heinrich Kansleiter	2.27	1.90	0.37
Jewel	2.24	1.66	0.58
Mauvette	1.75	1.33	0.42
Miss Bloomington	2.10	1.62	0.48
Revue	1.47	1.24	0.23
Rosewings	1.47	1.45	0.02
Salmon Plume	2.36	2.04	0.32
Total loss			4.86
Net gain			6.85
Midseason varieties (94-101 days)			
Varieties which gained:			
Apricot Glow	1.51	1.83	0.32
Bit o'Heaven	1.97	3.12	1.15
Blue Danube	1.14	2.00	1.86
Cara Mia	0.99	1.20	0.21
Dr. Moody	0.96	1.40	0.44
Duchess of York	1.24	1.65	0.41
Giant Nymph	1.39	2.52	1.13
Helen Howard	1.97	2.22	0.25
Indian Maiden	1.11	2.08	0.97
James Dunlop	1.32	3.00	1.68
Janet	1.27	1.43	0.16
Jocelyn	1.52	1.84	0.32
Joe Coleman	1.11	1.76	0.65
Joerg's White	1.54	3.31	1.77
Joyful	1.22	1.32	0.10
Krimhilde	1.34	1.72	0.38
Marie Kunderd	1.05	1.30	0.25
Orange King	1.89	2.49	0.60
Orange Sovereign	1.65	2.64	0.99
Prudence	0.98	1.05	0.07
Schwaben Girl	1.78	2.33	0.55
Yvonne	1.54	1.90	0.36
Total gain			14.62

TABLE XVI (Continued)

	Spring 1935	Fall 1936	Gain or loss
	cu.in.	cu.in.	cu.in.
Varieties which lost:			
Berty Snow	1.24	1.15	0.09
Copper Bronze	1.73	1.31	0.42
Coronation	2.56	2.51	0.05
Crimson Glow	1.78	1.31	0.47
E.J. Shaylor	1.62	1.29	0.33
Goldfinch	2.85	2.04	0.81
Jonquil	3.18	1.77	1.41
Morning Glory	3.00	1.78	1.22
Nimbus	1.65	1.21	0.44
Opalescent	2.07	1.91	0.16
Orange Lady	1.70	1.22	0.48
Pelegrina	1.43	1.32	0.11
Rideau	2.15	1.52	0.63
Rose Doree	1.91	1.47	0.44
Total loss			7.06
Net gain			7.56
Late-midseason varieties (102-109 days)			
Varieties which gained:			
Beauty Wave	1.57	1.81	0.24
Benedict	1.25	2.21	0.96
Betty Co-Ed	1.45	1.90	0.45
Betty Joy	1.22	1.38	0.16
Cherry Red	1.55	1.73	0.18
Conflagration	1.46	1.55	0.09
Emile Aubrun	1.80	3.89	2.09
Hilda	1.52	1.84	0.32
Juan de Fuca	1.80	2.16	0.36
Loyalty	1.69	2.68	0.99
Marietta	1.34	1.88	0.54
Marmora	1.59	1.74	0.15
Peep o'Day	1.79	2.57	0.78
Picardy	1.81	2.26	0.45
Princess Yaada	1.68	1.73	0.05
Serrata	1.17	1.80	0.63
The Grand Guardian	1.39	1.45	0.06
Troubadour	1.79	2.29	0.50
Viola Steves	1.30	2.35	1.05
Total gain			10.05

TABLE XVI (Continued)

	Spring 1935	Fall 1936	Gain or loss
Varieties which lost:			
Anna Eberius	1.37	1.17	0.20
Appleblossom	3.26	1.48	1.78
Belinde	1.16	1.11	0.05
Captain Boynton	1.42	1.29	0.13
Gertrude	2.15	1.70	0.45
Gloriana	1.86	1.43	0.43
Groff's Majestic	3.02	1.54	1.48
Los Angeles	1.74	1.01	0.73
Olive Goodrich	1.64	1.32	0.32
Pfitzer's Triumph	1.64	1.04	0.60
Queen of the Night	1.32	1.27	0.05
Reverie	3.67	1.75	1.92
Total loss			8.14
Net gain			1.91
Late varieties (110 days and over)			
Varieties which gained:			
Aflame	1.07	1.99	0.92
Betty Nuthall	1.29	1.40	0.11
Bobby	1.73	1.86	0.13
Commander Koehl	1.16	2.10	0.94
Duna	1.49	2.08	0.59
Sultan	1.07	1.93	0.86
Total gain			3.55
Varieties which lost:			
Albatross	2.27	1.32	0.95
Bill Sowden	1.40	1.29	0.11
Carmen Sylva	1.38	0.94	0.44
Director	1.32	1.22	0.10
Dracocephalus sp.	1.39	1.23	0.16
Dr. F.E. Bennett	1.33	1.11	0.22
Flaming Meteor	2.66	1.30	1.36
Golden Dream	2.08	1.62	0.46
Heavenly Blue	1.32	1.29	0.03
Lady Winsome	1.64	1.24	0.40
Mammoth White	1.86	1.74	0.12
Memory of William Pfitzer	1.11	0.88	0.23
Mrs. F.C. Hornberger	1.80	1.20	0.60
Mrs. Leon Douglas	1.86	1.33	0.53
Mrs. P.W. Sisson	2.15	1.62	0.53
Predominator	1.75	1.30	0.45
Vermilion	1.80	1.30	0.50
Total loss			7.19
Net loss			3.64

The net gain of 1.04 cubic inches in the early group is slight. It was thought that the gain from this group, which had ample time to mature corms, would have been higher, and probably this would have been so if more varieties had been included. It will be noted that the number of varieties in the group is comparatively small.

The net gain of 6.85 cubic inches for the Early midseason group would appear to be significant. The conclusion drawn here is that varieties which bloom in less than 93 days have ample time to mature their corms and will succeed. It will be noted that several varieties in this class, "Butterboy", "Fuergarbe", and "Miss Bloomington", lost heavily, and the question is raised as to why they should be included in the classification of successful varieties. There are many varieties which, as a rule, produce two or more plants per corm, resulting in the production of two or more corms in the fall, and these varieties possess this characteristic. For instance, "Butterboy", in the two years, produced 28 corms from an original 10. Were the corms from these varieties treated so that only one bud grew, the result would undoubtedly be an increase. The fact that other varieties gained but slightly was likely due to this factor.

Although the net gain for the Midseason group, 7.56 cubic inches, is more than that for the Early

midseason one, the percentage gain is less. The net gain for the Late midseason group is very slight, 1.91 cubic inches, and with Late varieties the loss is in excess of the gain. The data supply proof that large corms of most late varieties will show a significant loss in size at the end of two years in a short-season environment.

Table XVII is a summary of Table XVI, showing more clearly the reaction of corms of various seasonal classes for the two years. The percentage gain is calculated on the basis of the sum of the volumes of all the varieties in each seasonal class, in the fall of 1936, and total volume in the spring, 1935. This shows conclusively that corms in the late classes will not maintain their quality in a short-season environment.

TABLE XVII

Percentage gain of corms of early, early midseason, midseason, late midseason, and late varieties after two year's growth

Season of bloom	Total volume Spring 1935 cu. in.	Total volume Fall 1936 cu. in.	Per cent gain
Early	16.34	17.38	6.4
Early midseason	54.63	61.48	12.5
Midseason	59.36	65.92	11.1
Late midseason	53.36	55.33	3.7
Late	38.63	33.29	-13.8

DIFFICULTIES CONFRONTING THE STUDY

(a) Age of corm: There has been no way of knowing the age of the various stocks that were donated. For instance, some of the corms may have grown for four or five years after they had reached maturity, so that their vitality would be partly depleted when received. Some other of the stock may have consisted of young, vigorous corms which had just reached full size. The age of the corm undoubtedly varied with stocks in this work. It is likely that study over a longer period of years would increase the accuracy of the data.

(b) Source of the corms: Some of the corms had been grown in the Edmonton district the previous year, whereas others were grown in various parts of Canada and the United States. The shipped corms, therefore, were grown under widely differing soil and climatic factors prior to their receipt.

(c) Storage prior to planting: Storage is an important factor in keeping the corms in good condition. Ideal storage conditions are where the temperature is constant at about 40°F., the atmosphere is fairly humid, yet circulation of air is good. Commercial growers usually have specially constructed storage houses where these conditions are fairly closely approximated. Where corms are stored under such conditions, they do not lose in moisture, and retain their full vigour. Amateur

growers usually have room in their basement as available storage space, where conditions do not even closely approach the optimum either as to temperature or humidity. The result in such cases is much shrinkage and loss in vigour. The corms donated by local amateur growers could not have been uniform in respect to storing conditions. Only varieties grown in the test garden for two years were included in this study. Storage conditions at the University approach very closely the optimum, and the average of two years' results thus tended to reduce the error arising from differences due to storage conditions previous to receipt of the corms.

(d) Identity of measurements: It was impossible, due to lack of time or assistance, to take the measurements of each corm in the spring, keep each separate as to identity, and take measurements in the fall of the corresponding corm. It was possible only to take measurements of all the corms in the spring and to repeat this in the fall each year. The very large number of measurements included in this study, however, have helped to indicate general trends.

(e) Pests: Disease resulted in the loss of corms in several cases, so that the number harvested was smaller than would be expected under normal conditions. Thrips, which are a serious pest in many plantings, caused no serious losses in the plantings in which this work was conducted. When corms had to be discarded because of disease, measurements were first taken. On

the whole, because of pre-planting treatment with Calogreen (mercurous chloride), damage from pests was less in this planting than in those of most growers.

(f) Seasonal differences: The summer season of 1935 was very different from that of 1936, the former being a cold, wet season with early fall frost, and the latter was hot and dry with a comparatively late killing temperature. This seasonal factor was a disturbing influence in the effort to interpret corm behaviour. It may be that the two years provided extremes within which the results could well apply to a more average year or over a period of years.

(g) Number of corms per variety: The number of corms in each variety was not uniform, varying from 5 to 25. This factor was taken into consideration as outlined later.

(h) Varietal differences: To overcome this factor, as far as possible, the varieties were grouped into classes with respect to date of bloom. The general trend is for varieties of the same season of bloom to behave in similar fashion in regard to the corm.

(i) Duration of work: Only two years' experience is recorded here. The seasons were not alike, nor was either a so-called average season.

It is likely that study over a longer period of years would increase the accuracy of the data. It should be borne in mind, though, that significant facts established under two opposite extreme conditions may conform closely to an average period.

DISCUSSION AND CONCLUSIONS

In spite of the difficulties previously outlined, the trends observed have been very definite. It is the purpose here to review briefly and to discuss their significance.

1. There seems to be no direct correlation between the number of cormels produced per corm and season of bloom. It was thought that early blooming varieties would tend to produce a greater number per corm than late-flowering varieties. The cormel is not developed until fairly late in the growth stage, and it seemed logical to assume that the tendency for early maturing plants is to produce cormels to the fullest extent of their potential ability. Late-flowering varieties, on the other hand, do not fully mature their corms, but still seem able to produce cormels to as high a degree as early varieties. There are at least two theories which would account for this behaviour: (a) Late varieties are inherently capable of producing as large, or even a larger number of cormels than early varieties, a characteristic which may have been inherited from late-flowering native species where those plants which did not produce a larger number of cormels were gradually "weeded out"; (b) in late varieties, the cormel is matured in a shorter period of time than in the case of early-flowering ones. Whatever the cause may be, it is

significant that late-flowering varieties will produce as many cormels as will early-flowering varieties.

2. Pre-planting treatment of cormels is significant in shortening the time required to propagate the stock of gladiolus varieties. The results indicate that such simple methods as soaking cormels for 24 hours in water immediately prior to planting, and scarification by breaking the cormel coat between the fingers, will result in a considerable increase in the harvest. Slow germination is generally correlated with hardness and thickness of cormel coat. In such cases it was found that scarification of cormels produced more satisfactory results. It is possible that soaking for a period of three to four days might serve to break down the cormel coat to the extent that such a treatment might be the equal of scarification. However, it was not possible to carry out more extensive tests. Where germination is naturally rapid, the cormel coat is usually thin, and the treatment most satisfactory is soaking. In one case, little advantage was derived from either treatment; in fact, soaking caused some loss in corm production. Here the cormel coat was very thin, the cormel naturally germinated very readily, scarification being of very little value, and soaking actually causing some damage. Although the fact is generally recognized that pre-planting treatment of corms will in some cases increase the number of cormels germinating, it is not realized that

it also affects considerably the amount of corm material produced.

3. The quality of corm harvested in a normal season may be fairly well indicated by the width of corm planted. The results show that wide corms will produce better quality corms in the fall than will narrow ones. There is a closer correlation, however, between depth of corm and quality of corm harvested. On the average, high-crowned corms will produce corms of better quality than shallow ones. Although results obtained do not show differences that can be called significant, it seems probable that volume is a better indication of quality than depth.

4. Corms of late-blooming varieties which require over 110 days to bloom will not maintain their quality in a short-season environment. Of 23 late-blooming varieties grown, only 5 maintained or increased in quality of corm. These results support the viewpoint that in order for varieties of Gladiolus to succeed, it is necessary that their corms be matured before harvest, so that this vegetative means of propagation will have developed its full potential power to produce a plant the following year.

SUMMARY

1. Late-blooming varieties of Gladiolus will

produce as many cormels as will early-blooming varieties, apart from varietal differences, in a short-season environment.

2. Pre-planting treatment of cormels has indicated that:

- (a) the time required for germination is decreased,
- (b) the number of cormels harvested is increased,
- (c) the time required to bring the treated stock to blooming-size is materially decreased,
- (d) in general, the type of treatment to employ can be predicted from the nature of the cormel coat.

3. Depth of corm is a better index in gauging probable success than width. In addition, it is probable that corm volume is more significant than depth.

4. It appears to be definitely established that late-blooming varieties will not maintain corm quality in a short-season environment.

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